

Original Research Article

Volume 5, Issue 5 -2019

DOI: <http://dx.doi.org/10.22192/ijcrms.2019.05.05.003>

The Prevalence of Sinusitis in Iranian asthmatic children: A systematic review and meta-analysis

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Abstract

Introduction: the aim of this study was to evaluate The Prevalence of Sinusitis in Iranian asthmatic children

Methods: The searches were conducted in English and Persian by two independent scholars in international databases (PubMed, Web of science, Scopus and Google scholar) and domestic ones (SID, Magiran) to find relevant studies with a time span from the very onset of the database until September 2018 (without time limit). The keywords used in the searching strategy included sinusitis, asthma, asthmatic children, "prevalence" and "Iran" which were combined with Boolean operators, AND, OR and NOT.

Results: Three studies conducted on 304 children were included in the meta-analysis, the overall Prevalence of Sinusitis in 304 Iranian asthmatic children was 29.8 % (95% CI: 25.4, 34.2; $I^2 = 98.1\%$).

Conclusion: The results of the present study showed that the prevalence of sinusitis was high in Iranian children with severe asthma; additionally, cough can be a symptom of suspected sinusitis in patients with asthma. Although there may not be any relationships between the severity of asthma and sinusitis, the possibility of sinusitis be considered when the asthmatic patient does not respond to treatment.

Keywords: Asthma, asthmatic children, sinusitis.

Introduction

Asthma is a chronic inflammatory disease of the airways, in which several cells, particularly mast cells, lymphocyte T cells, and eosinophil are involved (1). Frequent wheezing, shortness of breath, chest tightness and coughing are common symptoms in individuals susceptible to this inflammation (2). These symptoms are usually associated with a narrowing of the airways that is partly reversible (3). This inflammation increases the response of the airways against various provocations (4). This disease can be considered as an epidemic that has a major impact on the health and socioeconomic status of communities;

the number of cases in the United States in recent decades has increased by more than 160% in subjects under 5 years old and by 74% among those aged 5-14 years (5). Various studies have shown that persistent asthma, poor follow-up treatment, lack of adequate initial control, frequent hospitalization, emergency check-ups, inadequate follow-up, lack of information on the severity of illness and inappropriate consumption of corticosteroids can be the cause of death (6). In a number of studies conducted to assess the relationship between sinusitis and asthma in adults, most patients with asthma turned out to

have mucosal hypertrophy in the sinus graft without any clinical signs in favor of bacterial sinusitis (7). The involvement of the sinus involvement may be one of the causes of non-controllability of asthma (8). According to these studies, sinus involvement may be a risk factor for the severity of asthma and subsequent complications (9). Many of the triggers of asthma and sinusitis, including mediators, cytokines and neurotransmitters, are common and similar in these two distinctly different diseases (10). There are various hypotheses regarding the relationship between sinusitis with asthma, the first theory being the direct aspiration of mediators from the lower airways and the subsequent theory of sinobrobenic reflex, which is stimulated by cholinergic pathway (11). After a while, it was observed that the severity of sinusitis in patients with asthma was directly associated with increased eosinophil levels in peripheral blood flow and sputum in patients (12). The result of this study confirmed the effect of the upper respiratory tract infection on the severity of asthma through the bloodstream (13). The aim of this study was to evaluate The Prevalence of Sinusitis in Iranian asthmatic children.

Materials and Methods

The methods used in the present systematic review were developed in accordance with the instructions in the PRISMA checklist [20]. Cross-sectional, case-control, and cohort studies were included in the present research; case series, letter to editors, case reports, clinical trials, study protocols, systematic review and narrative review are not included.

Searching strategy

The searches were conducted in English and Persian by two independent scholars in international databases (PubMed, Web of science, Scopus and Google scholar) and domestic ones (SID, Magiran) to find relevant studies with a time span from the very onset of the database until September 2018 (without time limit). The keywords used in the searching strategy included sinusitis, asthma, asthmatic children, "prevalence" and "Iran" which were combined with Boolean operators, AND, OR and NOT.

Study selection and data extraction

Two researchers reviewed the titles and abstracts independently, taking into account the eligibility criteria. After removing repeat studies, the full text of the studies was evaluated based on eligibility criteria and, if needed, the required information was obtained from the authors.

Quality assessment

Hui et al tools were used to evaluate the quality of the methodology and the risk of bias in each individual observational study [21]. Meta-analysis was conducted using STATA 14.

Results

Study selection

The initial searching process yielded a total number of 406 articles from various sources. 212 studies turned out to be non-repetitive, out of which 194 studies were excluded due to unrelated titles during title and review process. 3 out of 10 studies met eligibility criteria. 7 other studies were removed for different reasons, 1 were reviews, 1 were letters to editor, and 5 did not have the minimum required to be included the study.

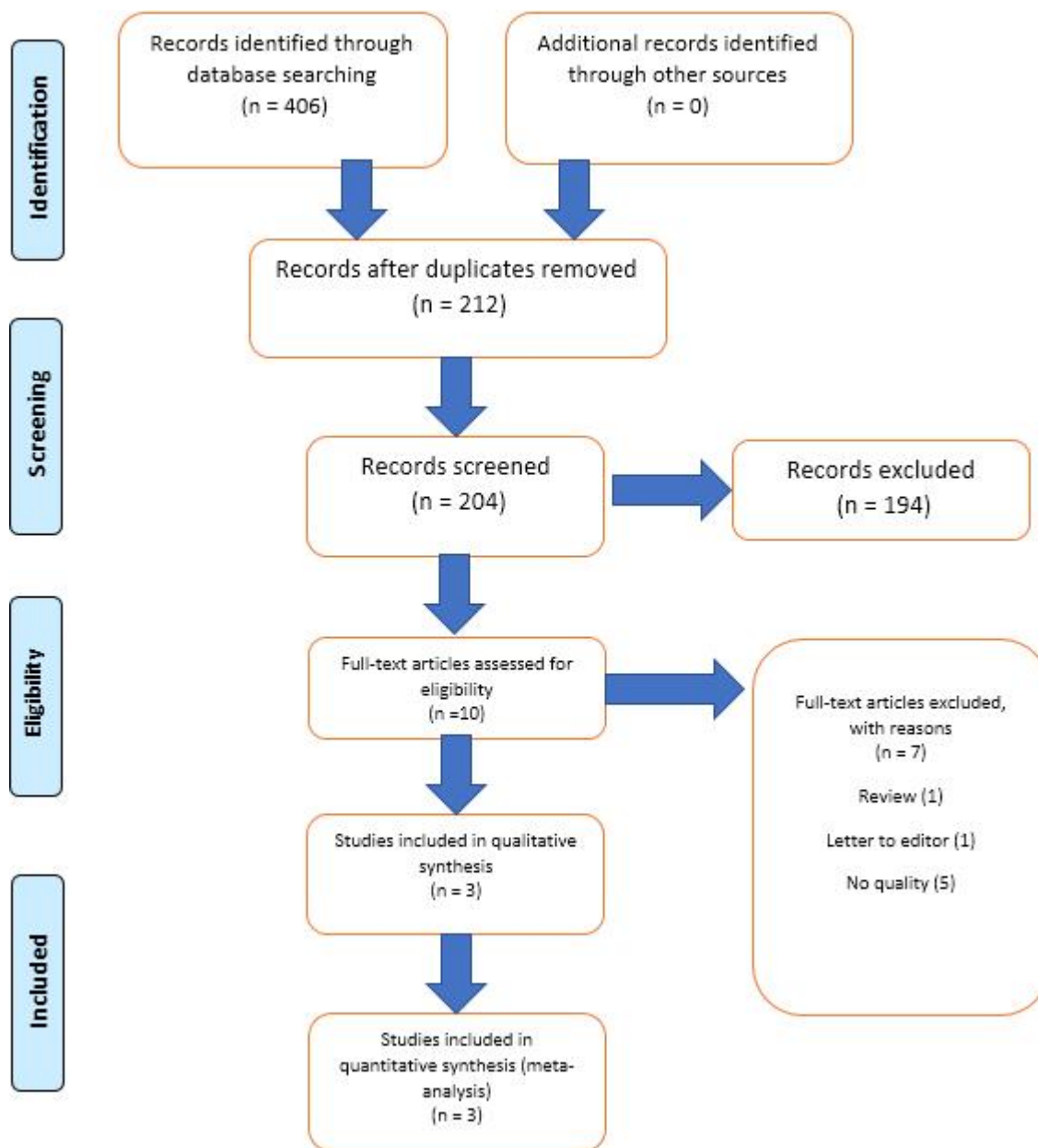


Fig 1. PRISMA flow diagram

Study Specifications

Studies had been conducted on 304 patients. The age range of the subjects was between 1 and 12 years old. All studies had provided cross-sectional data. 3 studies, which underwent the review process, were obtained from three provinces, Tabriz, Tehran and hamadan. The most common

sampling methods turned out to be simple sampling, purpose-based, census-based, and simple random sequences. More than 50% of studies turned out to have minor risk of bias; one study was removed due to poor quality. The most common site at which studies had been conducted was hospital (n = 2) (Table 1).

Table 1. Studies included in the systematic review and The Prevalence of Sinusitis in Iranian asthmatic children

ID	First Author	Year	Province	Sample size	ES	95% CI for ES		% Weight	Risk of bias
						Low	Up		
1	Billon ^[17]	2008	Tabriz	173	0.150	0.097	0.203	69.30	Low
2	Ehsanipour ^[18]	2005	Tehran	71	0.732	0.629	0.835	18.47	Moderate
3	Safari ^[19]	2009	Hamadan	60	0.483	0.357	0.609	12.23	Low
4	Pooled ES	----	-----	304	0.298	0.254	0.342	100	-----

The Prevalence of Sinusitis in Iranian asthmatic children

Three studies conducted on 304 children were included in the meta-analysis, the overall

Prevalence of Sinusitis in 304 Iranian asthmatic children was 29.8 % (95% CI: 25.4, 34.2; $I^2 = 98.1\%$).

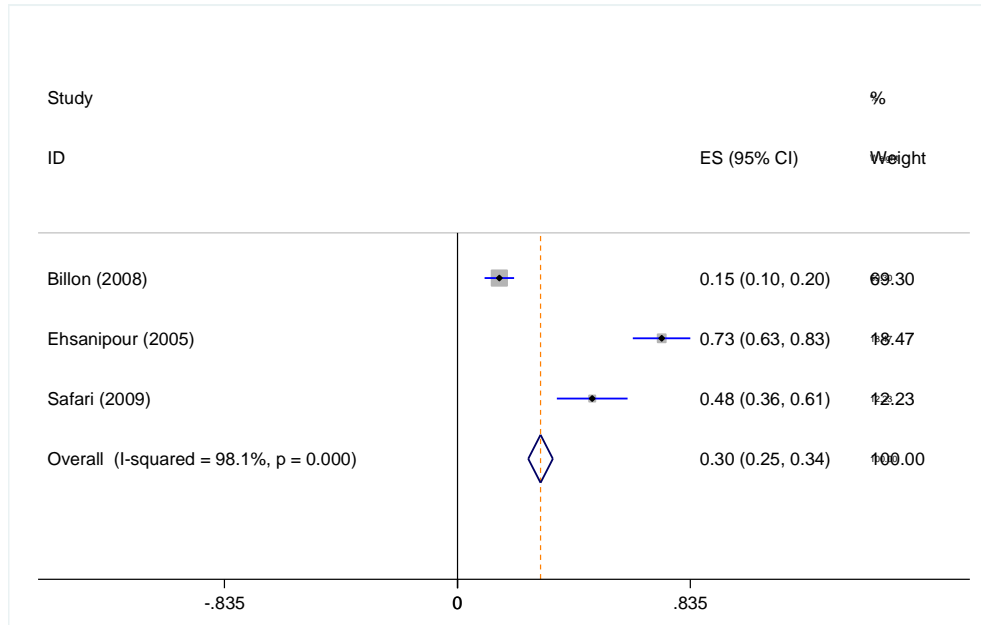


Fig. 2 :The Prevalence of Sinusitis in Iranian asthmatic children and its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the% value and the length of the lines showing the 95% confidence interval in each study. The oval sign shows The Prevalence of Sinusitis in Iranian asthmatic children for all studies

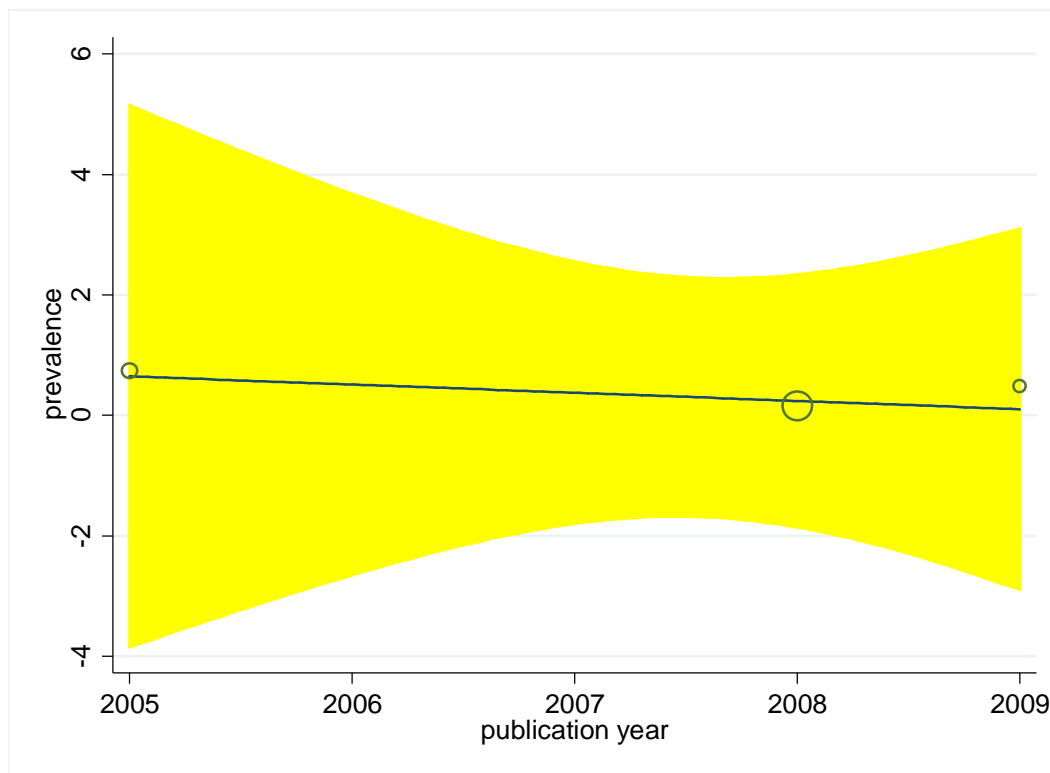


FIG. 3. Meta-regression between publication year and The Prevalence of Sinusitis in Iranian asthmatic children

Discussion

Three studies conducted on 304 children were included in the meta-analysis, the overall Prevalence of Sinusitis in 304 Iranian children was 29.8 % (95% CI: 25.4, 34.2; $I^2 = 98.1\%$). Asthma is the most common chronic childhood disease and airway obstruction disorder occurring mainly due to a reaction to immunologic and non-immunological stimuli caused by epithelial damage, subendothelial collagen deposition, and smooth muscle and glandular hypertrophy (14).

The mucosal relationship between asthma and sinusitis has been discussed since Galen. In a study by Newman et al in 1994, followed by Bresciani et al. in 2001, both of which were conducted on asthmatic adults, the prevalence of sinusitis was reported to be 74-90%; however, this was quite asymptomatic in the majority of patients (15). In general, researchers believe that sinusitis and asthma should not be considered apart because they both are inflammatory processes that share common pathology in the respiratory system (16).

The most common clinical symptoms are coughing and lateral secretion at the back of the throat (22). Cough can be by itself a symptom of asthma, or it can be a sign of sinusitis. Therefore, the diagnosis of coughing is important in patients with asthma because of the need for antibiotic therapy in asthma and the need for asthma drugs in sinusitis (23). Cough is a distressing symptom for the patient and his or her family; if prolonged, it causes concern for the family. The results of Dixon's study indicated that coughing increased in the presence of sinusitis. In regard with the findings of the present study, the presence of sinusitis caused more severe symptoms, including cough, loss of quality of life and sleep disorders, and enhanced severity of asthma (24).

The results of the present study showed that the prevalence of sinusitis was high in Iranian children with severe asthma; additionally, cough can be a symptom of suspected sinusitis in patients with asthma. Although there may not be any relationships between the severity of asthma and sinusitis, the possibility of sinusitis be considered when the asthmatic patient does not respond to treatment.

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Majid Reza Akbarizadeh. (2019). The Prevalence of Sinusitis in Iranian asthmatic children: A systematic review and meta-analysis. Int. J. Curr. Res. Med. Sci. 5(5): 19-25.
DOI: <http://dx.doi.org/10.22192/ijcrms.2019.05.05.003>