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Frequency of urinary tract infection in children with febrile convulsion: A systematic review and meta-analysis

Mehran Hesaraki¹, Mohammad Hasan Mohammadi*¹¹ Department of Pediatrics, Zabol University of Medical Sciences, Zabol, Iran**Corresponding author:** Mohammad Hasan Mohammadi : Department of Pediatrics, Zabol University of Medical Sciences, Zabol, IranE-mail: thn.search@gmail.com

Abstract

Introduction: Given that overdue diagnosis of urinary tract infections can lead to renal scar, elevated blood pressure and chronic renal failure, any febrile child must be examined with the possibility of such a disorder in mind. The present study was conducted to investigate the exact incidence of urinary tract infection in children with febrile convulsion in Iran.

Methods: From the beginning of databases to June 30, 2018, International {PubMed, Web of Science (WOS) and Google scholar} and National {Scientific Information Database (SID), Magiran} databases were searched for related observational studies that were conducted in Iran including only on Iranian Patients and published in English and Persian languages. The quality of the articles was evaluated using the Hoy D tool.

Results: Based on the results of random effects model, the Frequency of urinary tract infection in children with febrile convulsion in 1391 patients was 4.2% (95% confidence interval [CI]: 0.032, 0.053, $I^2 = 81.1\%$).

Conclusion: The results of the present study showed that urinary tract infection is relatively common in children with fever and convulsion; thus, a febrile child must be closely examined with urine culture and urine analysis. Also, since urinary tract infections can be prevented and treated, measures must be taken to prevent, diagnose, and treat such patients more efficiently.

Keywords: Febrile convulsion; Convulsion; Children; Etiology; Nursing; urinary tract infection; children

Introduction

With an incidence of 4-6 cases per 1,000, seizure is the most common neurological disorder in pediatric medicine. Seizure has been reported in 10-15% of people, and 60% of such cases have happened during childhood (1-3). Out of 5 million people who are struggling with seizure around the world, 3 million are children, and 90% of these children live in developing countries (4). There are large differences in the incidence of seizure across the world (5). Epidemiologic studies on children's seizure disorders are important because they can help to compare prevalence, age, genetic background, type of seizure, and therapies of epileptic syndromes (6). Psychosocial

effects, cognitive disabilities, long hospitalization, and an increase in the cost of treatment make paying attention to this specific group of patients quite vital (7). More than 50% of children under the age of one who have febrile seizure experience relapse; this recurrence happens more than one time in 15% of cases (8-10). After upper respiratory tract infections, urinary tract infection is the second most common bacterial disease in children; it is the most common bacterial infection that affects human life (11). Infections in younger children are usually diagnosed when they are accompanied with fever (12). Urinary tract infections account for 20% of all medical counseling and 3.5% of infants' visits to the emergency department (13); the symptoms of urinary

tract infection is different at any age, and the younger the child is, the more specific the symptoms get (12). Given that overdue diagnosis of urinary tract infections can lead to renal scar, elevated blood pressure and chronic renal failure, any febrile child must be examined with the possibility of such a disorder in mind. The present study was conducted to investigate the exact incidence of urinary tract infection in children with febrile convulsion in Iran.

Methods

Eligibility criteria

The methods used for this systematic review were based on the "Cochrane Systematic Study Booklet" and "Appropriate Items for Systematic and Meta-Analysis Study (PRISMA)" tool. Observational studies conducted on general population have been added and studies conducted on specific population have been removed. Results are summarized as reported in the research. The minimum sample size was 25 patients in each study. The target population covers the total population of urinary tract infection in Iran who entered the study. Frequency of urinary tract infection in children with febrile convulsion was calculated in this study.

Searching strategies and databases

The review of references and resources was done using the Medical Subject Headings (Mesh) and keywords related to the source of information on the incidence of urinary tract infection in children with febrile convulsion. To find references, the international Databases (MEDLINE PubMed interface), Google Scholar, and Web of Science) and domestic databases (SIDs and Magiran) and journals were searched; unlimited searching, in terms of both setting and language, was done until June 30, 2018. PRESS standard and the Health Sciences Librarian were used for designing the strategy.

MEDLINE application was used to search other databases. In addition, PROSPERO was used to provide a systematic search that was completed recently. To search for headlines and abstracts, Boolean (AND, OR, NOT), mesh, coordinate {truncation} * and related words were used; following keywords were used to provide a comprehensive context: Febrile convulsion; Convulsion; Children; Etiology; Nursing, urinary tract infection; children, prevalence rate and percent.

Research selection and data extraction

According to the research protocol, two researchers observed the titles and abstracts separately according to the eligibility criteria; in the next step, after the removal of repeated studies, the full text of the paper was studied based on the eligibility criteria and the required information was extracted. Consensus method was used to solve the disagreements between two researchers. The extracted data included the general information (corresponding author, year and place), characteristics of the research (research design, sample size, location, study period, and risk of bias), and characteristics of participants.

Quality control

To assess the quality of the methodology and bias risk, each observation study was evaluated using a tool developed by Hoy et al; this 10-item scale evaluated the quality of the study in two dimensions, including external credentials (items 1 to 4 target populations, sampling frame, sampling method, and minimum indirect neglect) and internal validity (items 5 up to 9 covering methods for data collection, case definition, study tools, and data collection mode and item 10 covering assessing relevant assumptions or analyzes). The risk of abuse was assessed by two researchers separately and possible disparity of ideas was resolved by consensus.

Data collection

All eligible studies were included within the systematic review. The data was combined using forest plot graph; random effects model was used to evaluate overall **Frequency of urinary tract infection in children with febrile convulsion**. The heterogeneity of primary studies was assessed by performing I^2 tests. Subgroup analysis was conducted to determine the heterogeneity based on the participants in the study, gender, and age. Meta-analysis was performed using the STAT 14 statistical software.

Results

1. Selecting eligible papers and researches

In the initial search on various databases, a total of 291 articles were reviewed, 240 of which turned out to be repetitive during screening process of title and abstract. 30 articles were removed due to unrelated

title; out of the remaining 21 articles, 5 articles met the inclusion criteria. Of the 16 articles that were removed, 3 were reviews, 3 were letters to editors, 4

had no complete text, and 6 had low quality and could not be considered in the research. (Figure 1)

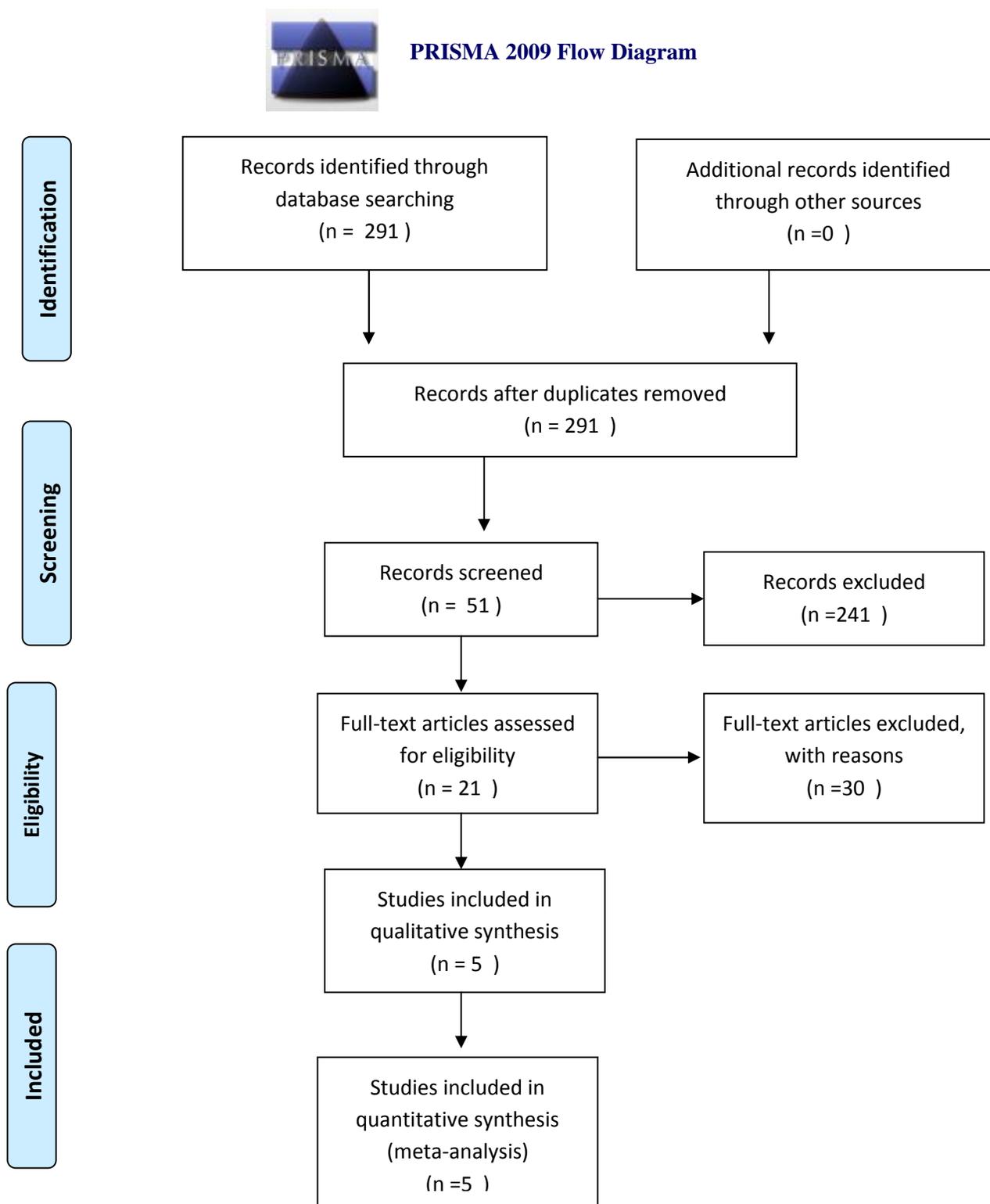


Fig. 1 Study selection process

2. Characteristics of the researches and papers

The final research was conducted on 1391 participants; a cross-sectional design was used in all studies. Research was conducted in only 5 provinces

out of 31 provinces of Iran. Of the 5 studies [16-20], one was from Mashhad [19], one from Sari [20] one from Ahvaz [16], one from Amirkala [18], and the other one was from Zahedan [17]. Required data was collected through interview (n = 5) and had a low bias risk (n = 4) (Table 1).

Table 1: Characteristics of final included studies about Frequency of urinary tract infection in children with febrile convulsion

ID	Author	Year	N	City	Type of study	prevalence	Bias
1	Momen ^[16]	2011	137	Ahvaz	Cross-sectional	0.06/6	Low
2	Khazaei ^[17]	2007	178	Zahedan	Cross-sectional	0.03/4	Low
3	Shirvani ^[18]	2000	230	Amirkala	Cross-sectional	0.02	Moderate
4	Esmaeeli ^[19]	2015	596	Mashhad	Cross-sectional	0.08/2	Low
5	Abbaskhaniyan ^[20]	2012	250	Sari	Cross-sectional	0.03/2	Low

Meta-analysis Frequency of urinary tract infection in children with febrile convulsion:

Based on the results of random effects model, the Frequency of urinary tract infection in children with

febrile convulsion in 1391 patients was 4.2% (95% confidence interval [CI]: 0.032, 0.053, I² = 81.1%) (Table 2).

Table 2: Frequency of urinary tract infection in children with febrile convulsion

Study	year	ES	95% conf Interval		weight
			low	up	
Momen	2011	0.066	0.025	0.107	6.12
Khazaei	2007	0.034	0.009	0.059	15.97
Shirvani	2000	0.020	0.002	0.038	33.31
Esmaeeli	2015	0.082	0.060	0.104	22.3
Abbaskhaniyan	2012	0.036	0.014	0.058	22.3
Pooled ES	-----	0.042	0.032	0.053	100

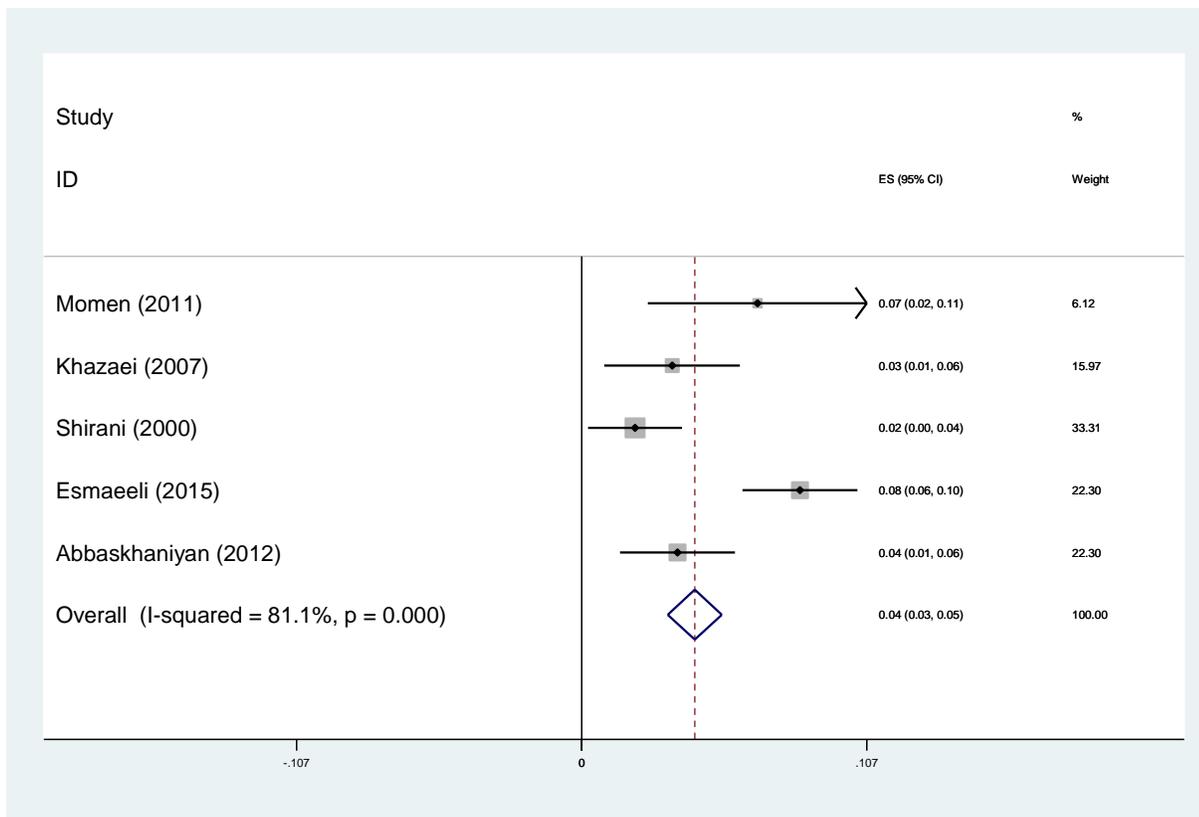


Fig. 2: The incidence of urinary tract infection in children with febrile convulsion and its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the % value and the length of the lines showing the 95% confidence interval in each study. The oval sign shows Frequency of urinary tract infection in children with febrile convulsion for all studies.

Discussion and Conclusion

With a prevalence of 3-4%, febrile convulsion is the most commonly reported childhood seizure disorder; this disorder develops mostly at the ages between 9 months to 5 years and the peak age is 18 months (14-15). Although seizures cause benign discomfort in the majority of cases, seizures requiring screening, diagnosis and planning are so frequent. A complete history, careful examination, and para-clinical assessment should be performed for each individual child, because diagnostic evaluation affects treatment decisions, family counseling, and the need for hospitalization and follow-up of the disease. The results of the analysis of 5 studies performed on 1391 subjects is presented in this research. The overall incidence of urinary tract infections in children with fever and convulsion in Iran was 4.2%, a rate which was obtained out of a comprehensive study of available evidence (Iran is a country with more than

80 million people in the Middle East). Symptoms of urinary tract infection differ in various ages. The younger the child is, the more specific the symptoms get. Given that overdue diagnosis of urinary tract infections can lead to renal scar, elevated blood pressure and chronic renal failure, any febrile child must be examined with the possibility of such a disorder in mind. The incidence of urinary tract infections is particularly important in young children, because the UTI may not produce clear clinical symptoms other than fever in this age group, and if it is not diagnosed timely, it can cause the renal scar in the patient. Besides, collecting urine sample in this specific age group is much more difficult than the older individuals, and sometimes it is necessary to get urine by means of vacuum aspiration or through urinary catheterization, which is not easy for the child and parents to accept.

Limitations

One of the limitations of the present study is the small number of studies conducted about **Frequency of urinary tract infection in children with febrile convulsion** in Iran. However, as long as the present researchers can claim, the present principled revision and statistical analysis has been the first attempt to evaluate the **Frequency of urinary tract infection in children with febrile convulsion** among the entire Iranian population. Another limitation of this study is the inclusion of only 5 provinces out of 31 provinces of Iran, a fact which makes it difficult to generalize the results. Although investigators kept cautious of writers, institutes, journals and other related information, two independent reviewers supervised the selection of related papers and the third reviewer solved all the and possible disagreements.

Strengths

The researchers can claim that this study is the first systematic review conducted to determine the **Frequency of urinary tract infection in children with febrile convulsion** in Iran. The present study was conducted on the basis of a systematic review plan and all databases were searched. Population-based studies were also applied to the final research.

Conclusion:

The results of the present study showed that urinary tract infection is relatively common in children with fever and convulsion; thus, a febrile child must be closely examined with urine culture and urine analysis. Also, since urinary tract infections can be prevented and treated, measures must be taken to prevent, diagnose, and treat such patients more efficiently.

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