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Prevalence and Risk Factors of a cute Thyroiditis in Children: A Systematic Review

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Abstract

Objectives: To evaluate and synthesize the existing literature on the prevalence and risk factors of acute suppurative thyroiditis (AST) in children. **Methods:** We performed a thorough search of electronic databases such as PubMed, Science Direct, Cochrane Library, and Scopus. Two independent reviewers evaluated and retrieved information from qualifying papers. **Results:** Our data consists of nine studies with 728 patients, 393 (53.9%) of whom were female. The prevalence of AST ranged from 1.3% to 14.6% among the Saudi pediatric population. The incidence of PSF and AST is concurrent. Clinicians should be extremely suspicious about anomalies of the third or fourth branchial, especially congenital PSF in children who repeatedly appear with AST or neck infections. The presence of pyriform sinus fistula was notably associated with recurrent episodes of thyroiditis, emphasizing the importance of early diagnosis and surgical intervention. Microbiological analysis revealed that Staphylococcus aureus and Streptococcus species were the most common pathogens isolated from cases of acute bacterial thyroiditis. US and US-guided antibiotic injections were the main approaches for management in AST cases. **Conclusion:** Even while AST is still rare, a few risk factors—like recent infections and congenital anomalies—greatly raise the chance that it may manifest. The results emphasize how crucial it is to identify problems early on and treat patients appropriately in order to avoid complications and enhance patient outcomes in children.

Keywords: Acute thyroiditis; Children; Pediatric; Prevalence; Associated risk factors; Systematic review.

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Introduction

It is uncommon to have AST. The thyroid's high iodine concentration, abundant blood supply, lymph outflow, and thyroid capsule are thought to contribute to its greater resistance to infection. It can be challenging to clinically distinguish AS) from subacute thyroiditis (SAT) at first because AST patients are

typically present with neck pain, fever, elevated white cell count (WCC), elevated ESR, and occasionally hyperthyroidism. However, SAT patients tend to be less systemically ill than AST patients. SAT, also called granulomatous thyroiditis or de Quervain's, is a considerably more frequent, self-limiting illness that may need glucocorticoid or anti-inflammatory medication therapy [1].

Traditionally, AST therapy has involved targeted antibiotic therapy in conjunction with surgery (thyroidectomy, parietal or complete) [2]. Antibiotic therapy without surgical intervention is not recommended in many published case studies [3]. However, more recent nonrandomized clinical practice seems to favor expectant care using intravenous antibiotics without invasive surgery, despite decades of studies characterizing surgical techniques as important to the clinical management of AST [4]. Thus, concerns about diagnosis and therapy continue.

Even though it's a very uncommon ailment, children's acute thyroiditis can have serious complications, particularly if the infection spreads quickly or the diagnosis is made too soon. Acute thyroiditis is difficult to diagnose because of its rarity and erratic presentation. This can lead to incorrect diagnoses or treatment delays that can have serious side effects. This systematic review is innovative because it focuses on compiling and analyzing the existing data to give a more comprehensive picture of the prevalence of acute thyroiditis in pediatric populations and the factors that may contribute to its development. The objective of this review is to improve clinical outcomes and early identification of acute thyroiditis in children by identifying these risk factors. The objective of this systematic review is to evaluate and synthesize the existing literature on the prevalence and risk factors of AST in children.

Methods

Following the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [5], this systematic review was conducted. We performed an extensive electronic search using PubMed, Web of Science, SCOPUS, Cochrane Library, and Science Direct, among other bibliographic databases. English-language research on t the prevalence and risk factors of acute thyroiditis in children was the focus of our search approach. To guarantee a comprehensive search, we employed pertinent terms associated with both Acute thyroiditis and children. In order to preserve neutrality, two impartial reviewers went through the search results, chose studies that fit the inclusion requirements, took out data, and used reputable assessment instruments to rate the included research's methodological quality.

Eligibility Criteria

Inclusion criteria:

- Studies that investigate the prevalence and risk factors of acute thyroiditis in children.
- Studies included children only (<18 years).
- Only studies written in English.
- Randomized controlled trials (RTCs), observational studies, cohort studies (retrospective and prospective), case-control studies, or cross-sectional studies.

Exclusion criteria:

- Studies that do not focus on the prevalence and risk factors of acute thyroiditis in children.
- Studies written in languages other than English.
- Case studies, opinions, comments, letters, reviews that don't include original research, and abstracts from conferences.

Data Extraction

Titles and abstracts found from the search were screened for screening accuracy and consistency by using pre-established inclusion and exclusion criteria to determine their relevance to the research issue. To

promote effective screening and lessen bias, reference management software such as Rayyan (QCRI) [6] was used. Research that at least one reviewer thought to be pertinent was advanced to full-text inspection by both reviewers. All disputes pertaining to inclusion were settled by consensus and dialogue. Using a standardized data extraction form, important data from the included studies was retrieved, including titles, authors, publication year, research setting, participant demographics (age and gender distribution), population type/ underlying condition, prevalence of AST, and primary outcomes. In addition, the risk of bias in the included studies was assessed using a recognized instrument for methodological quality evaluation.

Data Synthesis Strategy

To give a qualitative review of the research findings and components, summary tables were created utilizing data from pertinent studies. Once the data collection for the systematic review is completed, the appropriate way to use the data from the included studies will be decided.

Risk of Bias Assessment

The study's quality was assessed using the Joanna Briggs Institute (JBI) [7] critical assessment criteria for studies reporting prevalence data. This tool consists of nine questions, with positive responses getting a score of one and negative, ambiguous, or irrelevant responses receiving a score of zero. Scores of less than 4, 5 to 7, and 8 or higher will be rated as poor, moderate, and high quality, accordingly. Researchers separately assessed the study quality, and any discrepancies were resolved through discussion.

Results

Search results

Following the removal of 298 duplicates, a thorough search yielded 619 study publications. After 321 studies' titles and abstracts were reviewed, 288 papers were rejected. Two of the 33 reports that needed to be retrieved could not be found. 31 publications were screened for full-text review; 10 were rejected because the study findings were incorrect, 7 because the population type was incorrect, 3 were abstracts, and 2 were editor's letters. Nine of the research publications in this systematic review met the qualifying criteria. **Figure 1** depicts an overview of the approach used to choose the research.

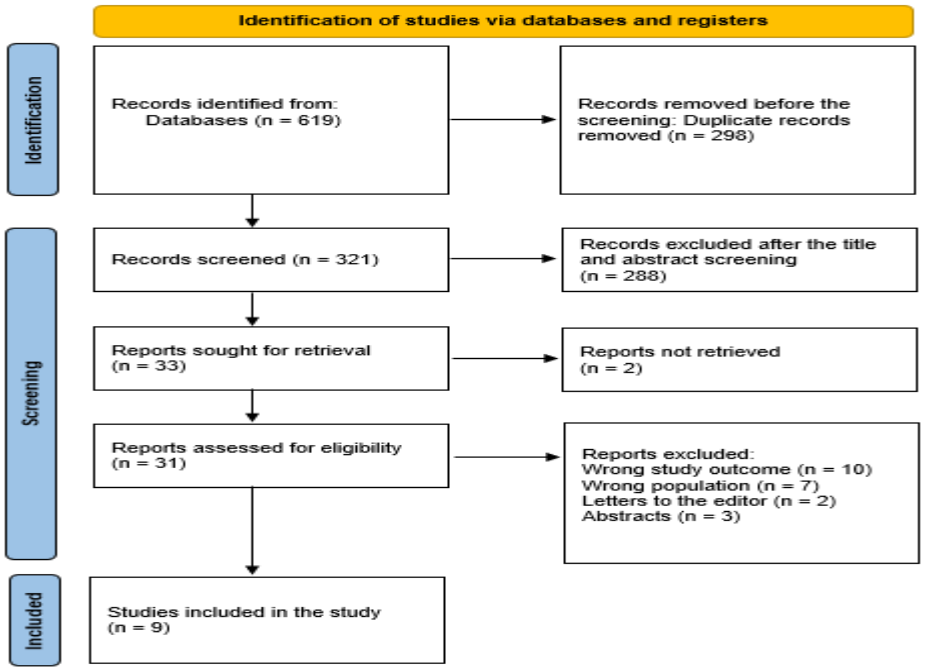

Figure 1: The study decision-making is summarized in a PRISMA diagram.

Sociodemographic parameters of the researched subjects

Table 1 illustrates the demographic data from the research articles. Our data consists of nine studies with 728 patients, 393 (53.9%) of whom were female. Six studies were Retrospective cohorts [9, 11, 12, 15, 16, 17] and three were retrospective case series [10, 13, 14]. Three studies were conducted in China [9, 11, 12], two in Taiwan [10, 17], one in Spain [13], one in Singapore [14], one in Nigeria [15], and one in India [16]. The earliest study was conducted in 2002 [17] and the latest in 2023 [13].

Clinical outcomes

The clinical parameters are displayed in **Table (2)**. The prevalence of AST ranged from 1.3% [15] to 14.6% [11] among the Saudi pediatric population. The incidence of PSF and AST is concurrent. Clinicians should be extremely suspicious about anomalies of the third or fourth branchial, especially congenital PSF in children who repeatedly appear with AST or neck infections. The presence of pyriform sinus fistula was notably associated with recurrent episodes of thyroiditis, emphasizing the importance of early diagnosis and surgical intervention. Microbiological analysis revealed that Staphylococcus aureus and Streptococcus species were the most common pathogens isolated from cases of acute bacterial thyroiditis. US and US-guided antibiotic injections were the main approaches for management in AST cases.

Table 1: Sociodemographic variables of the interested populations.

Study	Study design	Country	Participants	Mean age	Females (%)
She et al., 2022 [9]	Retrospective cohort	China	18	7.8 ± 3.8	10 (55.6%)
Huang et al., 2016 [10]	Retrospective case series	Taiwan	5	6.2 ± 0.7	2 (40%)
Sheng et al., 2014 [11]	Retrospective cohort	China	48	0.7-13	26 (54.1%)
Zhang & Tian, 2016 [12]	Retrospective cohort	China	64	12.7	31 (48.4%)
Gómez et al., 2023 [13]	Retrospective case series	Spain	3	3 to 5	2 (66.7%)
Sai Prasad et al., 2007 [14]	Retrospective case series	Singapore	12	5.6 ± 2.7	4 (33.3%)
Oyenusi et al., 2017 [15]	Retrospective cohort	Nigeria	546	9.4 ± 2.1	298 (54.6%)
Parida et al., 2014 [16]	Retrospective cohort	India	17	9.6	12 (70.6%)
Chi Hsin et al., 2002 [17]	Retrospective cohort	Taiwan	15	6.1 ± 2.9	8 (53.3%)

Table (2): Clinical features and results of the included research.

Study ID	Condition	AST prevalence (%)	Risk factors	Main outcomes	JBI
She et al., 2022 [9]	AST	NA	Positive pus cultures were detected in eight cases (six Streptococcus spp., one Staphylococcus spp., and one Streptococcus spp. and Staphylococcus spp. combined infection).	In doubtful circumstances, regular thyroid gland monitoring with ultrasonography is strongly recommended. Antibiotics combined with US-guided aspiration are a safe, effective, and noninvasive treatment for AST in children, which can shorten hospital stays.	Moderate
Huang et al., 2016 [10]	AST in PSF	NA	Clinicians should be extremely suspicious about congenital PSF in children who repeatedly appear with AST or neck infections.	NM	High
Sheng et al., 2014 [11]	AST in PSF	7 (14.6%)	PSF should be taken into account for any child who has a thyroid tumor or recurrent AST.	NM	Moderate
Zhang & Tian, 2016 [12]	AST in PSF	4 (6.3%)	Anomalies of the third or fourth branchial arch are more frequent than previously thought. Recurrent neck abscesses, severe suppurative thyroiditis, or respiratory distress are the most common presentations of these abnormalities.	NM	Moderate
Gómez et al., 2023 [13]	AST	NA	There were no immunosuppressive conditions present, and all the youngsters were previously healthy. Even yet, the primary risk	NM	High

			factor for AST is malformations.		
Sai Prasad et al., 2007 [14]	AST in PSF	NA	NM	PSF-related AST is a difficult condition to diagnose and treat since, even with careful dissection, recurrences are frequent.	Moderate
Oyenusi et al., 2017 [15]	Children with thyroid disorders	7 (1.3%)	NM	Pediatric thyroid problems are widespread, with congenital hypothyroidism being the majority. Newborns of moms with thyroid diseases should also be examined and monitored for best results.	
Parida et al., 2014 [16]	AST in PSF	NA	NM	Despite the fact that empirical administration of broad-spectrum antibiotics reduces inflammation, AST frequently necessitates ID, which complicates the definitive surgery.	
Chi Hsin et al., 2002 [17]	AST	NA	Oropharyngeal flora is typically the source of AST, resulting in combined pathogens on culture.	It is best to administer broad-spectrum antibiotics as soon as cultures are collected. AST may be diagnosed with the use of imaging techniques.	

***NM=Not-mentioned**

Discussion

This systematic review emphasizes the uniqueness and clinical importance of pediatric acute thyroiditis by offering a thorough examination of the prevalence and risk factors related to the illness. We found that the prevalence of AST ranged from 1.3% [15] to 14.6% [11] among the Saudi pediatric population. We did not find literature that reported the pooled prevalence of AST in children. The lack of this literature may restrict our understanding and interpretation of the results. However, we noticed that there is a great variance between the documented prevalences. It is essential to comprehend these contributing factors in order to properly interpret prevalence data and to enhance the diagnosis and treatment of this ailment in various groups.

We also found that the incidence of PSF and AST is concurrent. Clinicians should be extremely suspicious about anomalies of the third or fourth branchial, especially congenital PSF in children who repeatedly

appear with AST or neck infections. The presence of pyriform sinus fistula was notably associated with recurrent episodes of thyroiditis, emphasizing the importance of early diagnosis and surgical intervention. Thyroid gland immunity to pathogens is comparatively high [17]. The high iodine content of the gland, its abundant blood and lymphatic supply, and its physical separation from other neck structures have all been proposed as explanations for the unusually low incidence of thyroid infections. The thyroid gland's surrounding capsule and the absence of direct communication with nearby structures are the causes of this isolation. By direct expansion from adjacent sites, the thyroid gland is relatively resistant to infection because of all these characteristics [18]. Bacteria commonly infect the thyroid gland in infants through a fistula from the pyriform sinus that results from a third or fourth branchial arch abnormality [19, 20]. This kind of fistula is almost invariably left-sided and runs from the pharynx to the thyroid capsule; infants with left-sided or recurrent ST are more likely to have this sort of abnormality. The likelihood of recurrent thyroiditis in a child with a pyriform sinus fistula who presents with a first episode of ST is not known, but it seems to be high [19-21].

Retrospective data and case series are generally devoid of defined diagnostic criteria and outcome measurements, which makes them vulnerable to bias. Furthermore, it is difficult to get firm conclusions regarding the actual incidence of pediatric acute thyroiditis due to the variation in reporting prevalence across various geographic areas and healthcare environments. Moreover, evaluating the long-term consequences and recurrence rates of acute thyroiditis is hampered by the paucity of long-term follow-up data, especially for individuals with underlying congenital abnormalities. It is also more difficult to prove a link between recognized risk factors and the onset of acute thyroiditis in the juvenile population due to the dearth of large-scale cohort studies and randomized controlled trials.

Several directions for further investigation are proposed in light of the review's conclusions and limitations. In order to more accurately determine the prevalence and risk factors of acute thyroiditis in children, prospective, multicenter cohort studies with uniform diagnostic and outcome criteria are required. In order to take into consideration geographical differences in illness prevalence and management strategies, such studies should try to cover a variety of groups.

Conclusion

Even while AST is still rare, a few risk factors—like recent infections and congenital anomalies—greatly raise the chance that it may manifest. The results emphasize how crucial it is to identify problems early on and treat patients appropriately in order to avoid complications and enhance patient outcomes in children.

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