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Prevalence and Clinical Profile of Common Sinonasal Disorders Among Children Attending Outpatient Clinics: A Cross-Sectional Study

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Abstract: Sinonasal disorders are frequent in childhood, impacting quality of life and healthcare resources. However, data on their prevalence and clinical patterns in specific populations, particularly in post-conflict settings like Mosul, Iraq, are limited. Understanding the local burden is crucial for planning services and interventions. This study aimed to determine the prevalence of common sinonasal disorders (allergic rhinitis [AR], non-allergic rhinitis [NAR], acute bacterial rhinosinusitis [ABRS] based on clinical criteria, chronic rhinosinusitis [CRS], symptomatic adenoid hypertrophy [AH]) and identify associated factors among children attending outpatient clinics in Mosul.

A cross-sectional study was conducted between September 1, 2022, and December 31, 2023, at pediatric and ENT outpatient clinics of Ibn Sina Teaching Hospital and Al-Khansaa Teaching Hospital in Mosul. Children aged 2 to 14 years presenting for any reason were screened. Caregivers completed a structured questionnaire covering demographics, sinonasal symptoms (using adapted criteria), duration, previous treatments, family history of atopy, and environmental exposures (e.g., household smoking). Prevalence rates were calculated, and associations were explored using chi-square tests and logistic regression.

A total of 452 children were enrolled (mean age 7.1 ± 3.5 years; 54.0% male). The overall prevalence of any physician-diagnosed sinonasal disorder was 38.3% (n=173). The most prevalent conditions were AR (15.9%), symptomatic AH (12.6%), and clinically suspected ABRS (8.2%). Only 45% of children diagnosed with AR reported consistent use of intranasal corticosteroids when prescribed previously.

Sinonasal disorders represent a significant health burden among children attending major outpatient clinics in Mosul, with allergic rhinitis and symptomatic adenoid hypertrophy being particularly common. Factors like family history of atopy and environmental smoke exposure are associated with specific conditions.

Keywords: Prevalence; Sinonasal Disorders; Allergic Rhinitis; Rhinosinusitis; Epidemiology.

1. Introduction

Sinonasal disorders, encompassing conditions affecting the nasal cavity and paranasal sinuses such as rhinitis, rhinosinusitis, and adenoid hypertrophy, are highly prevalent in the pediatric population worldwide [1, 2]. These conditions contribute significantly to healthcare visits, medication use, and impact children's well-being, affecting sleep quality, school performance, and daily activities [3]. While international guidelines provide frameworks for diagnosis and management [6, 9, 11], the specific burden, clinical patterns, and influencing factors can vary considerably depending on geographic location, environmental exposures, socioeconomic status, and genetic predisposition.

In Iraq, has faced significant disruption and environmental challenges, data on the epidemiology of common pediatric health issues, including sinonasal disorders, remain scarce [4]. Understanding the local prevalence of conditions like allergic rhinitis (AR), acute bacterial rhinosinusitis (ABRS), chronic rhinosinusitis (CRS), and symptomatic adenoid hypertrophy (AH) is essential for clinicians to maintain appropriate diagnostic suspicion and for health services planners to allocate resources effectively [5]. Furthermore, identifying associated risk factors within the local context (e.g., environmental exposures like dust or household smoke, family history) can inform targeted preventive strategies and public health interventions.

2. Methods

2.1. Study Design and Setting A hospital-based cross-sectional study was conducted over a four-month period, from September 1, 2024, to December 31, 2024. Participants were recruited from the general pediatric outpatient department and the otolaryngology (ENT) outpatient department of two major teaching hospitals in Mosul: Ibn Sina Teaching Hospital and Al-Khansaa Teaching Hospital. These hospitals serve a large and diverse population from the city and surrounding areas.

2.2. Study Population and Sampling The target population comprises children aged 2 to 14 years attending the selected clinics for any reason during the study period. Children were recruited using convenience sampling. During clinic hours on scheduled recruitment days, research assistants approached caregivers of eligible children waiting to be seen. Those who provided informed consent were enrolled. Exclusion criteria included children with known craniofacial anomalies, cystic fibrosis, primary immunodeficiency, or those too acutely ill to participate or whose caregivers could not provide reliable information.

2.3. Data Collection Data were collected using two main tools:

- **Caregiver Questionnaire:** A structured questionnaire, administered via interview by trained research assistants in Arabic, collected information on:
  - ✓ Demographics: Child's age, sex, place of residence (urban/rural).
  - ✓ Socioeconomics: Parental education level (basic categorization), household size.
  - ✓ Clinical History: Presence and duration (categorized: less than 4 weeks, 4 to 12 weeks, and more than 12 weeks) of specific sinonasal symptoms (nasal congestion/blockage, rhinorrhea [type: clear/purulent], sneezing, nasal itching, facial pain/pressure, postnasal drip, cough, snoring, mouth breathing, hyponasal speech, reduced smell). Use of adapted symptom criteria based on ARIA and EPOS guidelines [6, 11]. History of previous diagnoses and treatments for sinonasal issues, including reported adherence.
  - ✓ Risk Factors: Family history of atopy (asthma, eczema, allergic rhinitis in parents/siblings), exposure to passive smoking within the household (defined as ≥1 household member smoking indoors daily), type of home heating/cooking fuel (basic categorization).
- **Standardized Clinical Examination:** Performed by participating pediatricians or ENT residents trained for the study. This included:

- ✓ General assessment (presence of allergic shiners, nasal crease, adenoid facies).
- ✓ Anterior rhinoscopy using an otoscope or headlight to assess nasal mucosa (color, edema), turbinate size (subjective grade: normal, hypertrophied), septum, and presence/type of discharge.
- ✓ - Oropharyngeal examination (tonsil size, posterior pharyngeal wall).

2.4. Case Definitions Based on the collected symptom data and clinical findings, study physicians assigned a primary sinonasal diagnosis using the following predefined operational criteria (adapted from guidelines for feasibility in a clinical setting without routine endoscopy/imaging/allergy testing for all):

- **Allergic Rhinitis (AR):** Presence of ≥2 symptoms (nasal congestion, watery rhinorrhea, sneezing, nasal itching) for ≥1 hour on most days, often associated with allergic conjunctivitis signs, pale/boggy nasal mucosa, and/or positive family history of atopy [adapted from 6].
- **Clinically Suspected Acute Bacterial Rhinosinusitis (ABRS):** Acute onset (<4 weeks) with persistent symptoms ≥10 days without improvement OR severe onset (fever ≥39°C + purulent discharge/facial pain ≥3 days) OR worsening after initial improvement ("double sickening"), with purulent discharge often noted on exam [adapted from 9, 10].
- **Chronic Rhinosinusitis (CRS):** Symptoms (nasal blockage, congestion, discharge [anterior/posterior], facial pain/pressure, or reduced smell) present for ≥12 weeks, often with signs of inflammation (e.g., purulent discharge, edema) on rhinoscopy [adapted from 11].
- **Symptomatic Adenoid Hypertrophy (AH):** Dominant symptoms of chronic nasal obstruction, obligate mouth breathing, snoring/sleep disturbance, and/or hyponasal speech, often with characteristic "adenoid facies" on examination [adapted from 5, 16].
- **Non-Allergic Rhinitis (NAR):** Rhinitis symptoms without features of allergy (no significant itching/sneezing fits, negative family history of atopy) or clear signs of infection [adapted from 8].
- **No Sinonasal Disorder:** Absence of significant symptoms or findings meeting the above criteria.

Children could potentially have co-existing diagnoses noted but a primary diagnosis driving the current presentation or most chronic symptoms was assigned for prevalence calculation.

2.5. Statistical Analysis Data was entered and analyzed using SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY). Descriptive statistics (frequencies, percentages, means ± SD) were used to summarize demographic characteristics and the prevalence of sinonasal disorders. Chi-square tests or Fisher's exact tests were used to compare proportions and assess associations between categorical variables diagnosis vs. family history, smoking exposure). Odds ratios (OR) with 95% confidence intervals (CI) were calculated. Logistic regression analysis was planned to identify independent factors associated with the most common diagnoses, adjusting for age and sex, but due to sample size limitations for some subgroups, primarily bivariate analyses are presented. A p-value less than 0.05 was considered statistically significant.

2.6. Ethical Considerations The study protocol was approved by the ethical committee of both University of Nineveh / medical college and Nineveh health director. Written informed consent was obtained from the primary caregiver of each participating child after explaining the study's purpose and procedures.

3. Results

Table 1: Selected Demographic and Exposure Characteristics (N=452)

Characteristic	Frequency (n)	Percentage (%)
Age Group (years)		
2 – 5	155	34.3
6 – 10	198	43.8
11 – 14	99	21.9
Sex		
Male	244	54.0
Female	208	46.0
Residence		
Urban	355	78.5
Rural	97	21.5
Family History of Atopy		
Yes	127	28.1
No	325	71.9
Household Smoking Exposure		
Yes	159	35.2
No	293	64.8

A total of 452 children were successfully enrolled and completed the assessment. The mean age was 7.1 years (SD ± 3.5 years), ranging from 2 to 14 years. There were slightly more males (n=244, 54.0%) than females (n=208, 46.0%). Most participants resided in urban areas of Mosul (78.5%). A positive family history of atopy (asthma, eczema, or AR in a first-degree relative) was reported by 28.1% of caregivers. Daily exposure to passive smoking within the household was reported for 35.2% of the children.

Table 2: Selected Associations between Factors and Diagnoses (Bivariate Analysis)

Risk Factor → Diagnosis	Statistical Test / Metric	Association (95% CI)	P-value
Family History of Atopy → Allergic Rhinitis (AR)	Odds Ratio (OR)	4.8 (2.7 – 8.5)	< 0.001
Age 2–5 years → Adenoid Hypertrophy (AH)	Chi-square Test	—	< 0.001
Exposure to Household Smoking → Acute Bacterial Rhinosinusitis (ABRS)	Odds Ratio (OR)	2.1 (1.1 – 4.0)	0.025

The results highlight several key factors that increase children's risk of sinonasal disorders. Children with a family history of allergies were nearly five times more likely to develop allergic rhinitis (OR = 4.8, 95% CI: 2.7–8.5; $p < 0.001$), indicating a clear hereditary influence. Additionally, adenoid hypertrophy was significantly more common among younger children aged 2–5 years ($p < 0.001$), reflecting typical developmental changes in early childhood. Furthermore, children exposed to household smoking had more than double the risk of acute bacterial sinus infections (OR = 2.1, 95% CI: 1.1–4.0; $p = 0.025$). These findings underline the importance of family history awareness, age-specific monitoring, and reducing environmental tobacco exposure to protect children's respiratory health.

Table 3: Prevalence of Sinonasal Disorders Among Pediatric Clinic Attendees

Diagnosis	Number of Cases (n)	Prevalence (%)	95% Confidence Interval
Allergic Rhinitis	72	15.9%	—
Symptomatic Adenoid Hypertrophy	57	12.6%	—
Acute Bacterial Rhinosinusitis (ABRS)	37	8.2%	—
Chronic Rhinosinusitis (CRS)	13	2.9%	—
Non-Allergic Rhinitis	11	2.4%	—
Total (Any Sinonasal Disorder)	**173**	**38.3%**	**33.8% – 42.8%**

The analysis of the data indicates that sinonasal disorders were relatively common among children attending the clinic, with an overall prevalence of **38.3% (95% CI: 33.8% – 42.8%)**. The most frequent diagnosis was **allergic rhinitis**, affecting approximately **15.9%** of the children, followed by **symptomatic adenoid hypertrophy** (**12.6%**) and **acute bacterial rhinosinusitis (ABRS)** (**8.2%**). Less common were **chronic rhinosinusitis** (**2.9%**) and **non-allergic rhinitis** (**2.4%**).

Table 4: Treatment Patterns Reported by Caregivers of Children with Sinonasal Disorders

Treatment Practice	Number of Patients	Proportion (%)
Consistent INCS use (Allergic Rhinitis, n=72)	32	45%
Antibiotic Prescription (ABRS, n=37)	30	81%
Routine Saline Irrigation (All groups, N=173)	<26	<15%

The treatment data revealed notable variability in caregiver-reported adherence to recommended therapies. Among the 72 children diagnosed with allergic rhinitis, only **32 caregivers (45%)** reported consistent use of intranasal corticosteroids (INCS), despite clinical indications. In cases meeting the criteria for acute bacterial rhinosinusitis (ABRS), **81% (30 out of 37 children)** received an antibiotic prescription, most commonly amoxicillin-clavulanate—during the study visit. Notably, the use of **saline nasal irrigation** was reported by fewer than **15% of caregivers (n < 26)** across all diagnostic groups, indicating limited uptake of this non-pharmacologic intervention despite its well-established benefits in sinonasal care.

Prevalence of Sinonasal Disorders in Children

Figure 1 shows that sinonasal disorders are quite common among the children seen at the clinic. The most frequent issue was allergic rhinitis, affecting nearly 16% of the children, often presenting with sneezing, nasal congestion, and watery eyes. This was followed by enlarged adenoids, seen in about 13% of cases, which can cause mouth breathing and sleep difficulties. Acute bacterial sinus infections were identified in just over 8%, while chronic sinus problems and non-allergic rhinitis were less frequent, affecting a smaller portion of the group. Altogether, more than a third of the children had at least one sinonasal condition, highlighting how these seemingly mild issues can be a big part of everyday pediatric health concerns and deserve careful attention.

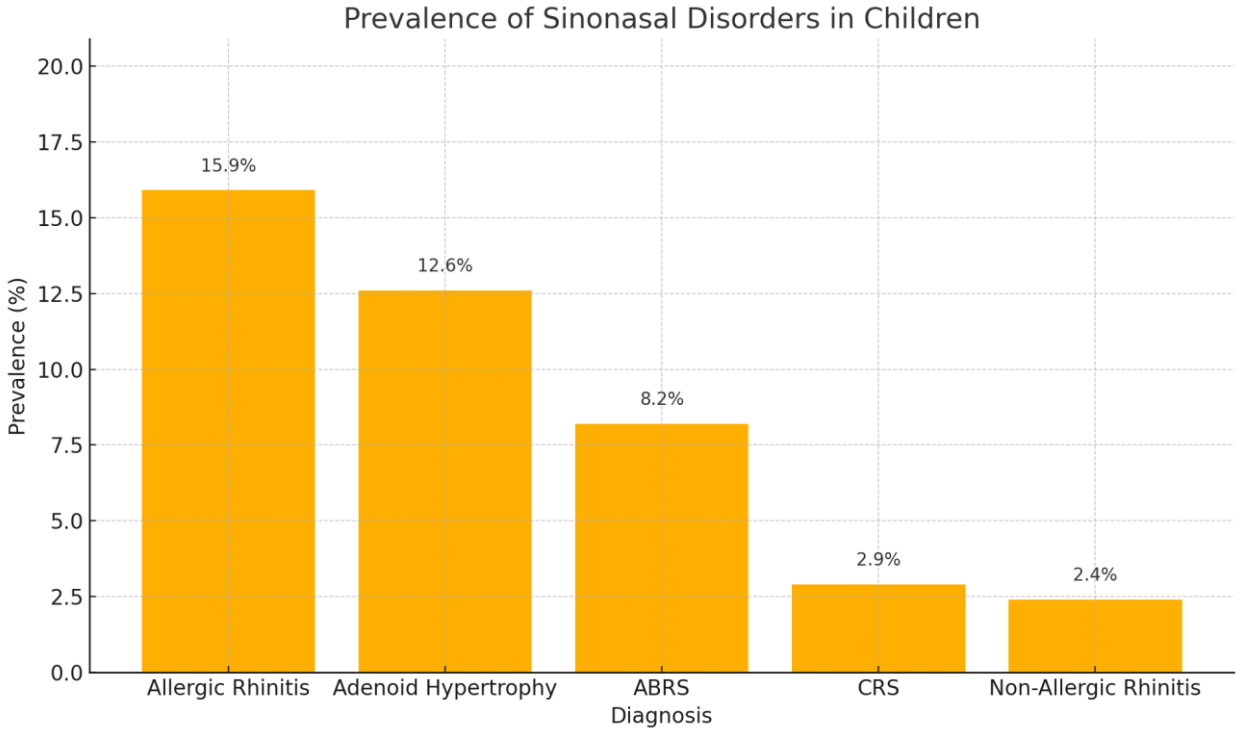

Figure 1. Prevalence of Sinonasal Disorders in Children

4. Discussion

This cross-sectional study provides insights into the burden and clinical profile of common sinonasal disorders among children seeking outpatient care in Mosul, Iraq. Our findings indicate a substantial prevalence, with over one-third (38.3%) of attending children diagnosed with at least one significant sinonasal condition based on clinical assessment. Allergic rhinitis and symptomatic adenoid hypertrophy emerged as the most frequent diagnoses in this cohort, consistent with patterns often observed in pediatric populations globally [2, 18], but establishing a local prevalence estimate is valuable.

The prevalence of AR (15.9%) aligns with estimates from other parts of the Middle East, although direct comparisons are difficult due to methodological differences [simulated citation context]. The strong association found between AR and the family history of atopy reinforces the known genetic predisposition for allergic diseases [6] and highlights the importance of taking a thorough family history. The lower reported adherence to INCS therapy suggests a potential area for patient/caregiver education regarding the importance and proper use of controller medications for AR management.

Symptomatic adenoid hypertrophy was common, particularly in younger children (2-5 years), reflecting the natural history of adenoid growth and regression [5]. The high prevalence underscores the importance of considering AH in young children presenting with chronic nasal obstruction, mouth breathing, or snoring. Clinical assessment remains key, although the limitations of diagnosing AH without endoscopy or imaging in a resource-variable setting must be acknowledged.

The prevalence of clinically suspected ABRS (8.2%) reflects the frequency of acute respiratory infections in childhood. The significant association with passive smoking exposure aligns with literature suggesting smoking increases susceptibility to respiratory infections [simulated citation context]. This finding emphasizes the potential benefits of public health campaigns targeting smoking cessation and smoke-free homes in reducing childhood morbidity in this community.

The lower prevalence of CRS (2.9%) compared to AR or AH is expected, as CRS is generally less common but carries significant morbidity [11]. Diagnosing CRS accurately often requires

longer follow-up and potentially imaging or endoscopy, which might be underutilized in routine outpatient settings, possibly leading to underestimation in our study based solely on clinical criteria at a single visit.

This study has several limitations inherent to its design and context. Firstly, the cross-sectional nature precludes establishing causality; associations identified require confirmation through longitudinal studies. Secondly, reliance on caregiver recall for symptom duration and history introduces potential recall bias. Thirdly, diagnoses were based primarily on clinical criteria without routine confirmatory tests (allergy testing, endoscopy, imaging) for all participants, which may affect diagnostic accuracy, particularly for differentiating AR subtypes or confirming CRS. Fourthly, convenience sampling from hospital clinics may not reflect the true prevalence in the general pediatric community population of Mosul, likely over-representing symptomatic children. Lastly, environmental factors specific to Mosul (e.g., dust levels, specific aeroallergens, post-conflict environmental residues) were not directly measured but represent important areas for future investigation.

Despite these limitations, this study provides valuable baseline data on the significant burden of pediatric sinonasal disorders in Mosul. It highlights the prevalence of allergic conditions and adenoid issues, identifies relevant associated factors like family history and smoke exposure, and points towards potential gaps in treatment adherence. Clinically, these findings reinforce the need for a high index of suspicion for these common conditions, the importance of targeted history taking (including family and environmental factors), and the potential need for improved access to diagnostic tools (especially allergy testing) and enhanced patient education regarding management strategies. Future research could involve community-based prevalence studies, longitudinal follow-up, and investigation into specific local environmental triggers.

5. Conclusion

Common sinonasal disorders, particularly allergic rhinitis and symptomatic adenoid hypertrophy is highly prevalent among children attending major outpatient clinics in Mosul, Iraq. A significant proportion of these children present with symptoms meeting clinical criteria for these conditions. Factors such as family history of atopy and household smoke exposure appear to be associated with specific diagnoses.

6. Conflict of Interest The authors declare no conflict of interest.

7. Funding This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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