Pediatric Sinusitis:Symptom Profiles with Associated Atopic Conditions

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Introduction: *Sinusitis is a very common disease in childhood. Clinical manifestations in childhood sinusitis are different than in adult. Information in childhood sinusitis in Thailand is limited. We performed a prospective descriptive study to determine clinical characteristics of childhood sinusitis in Thailand*

Material and Method: *One hundred pediatric patients with clinical diagnosis of sinusitis attending pediatric allergy clinic, pediatric outpatient clinic, and pediatric ENT clinic were recruited. Clinical diagnosis was defined by presence of symptoms indicating upper respiratory infections with exudates at middle meatus by anterior rhinoscopy. Thorough history taking and physical examinations were conducted with findings recording into sinusitis questionnaire. Sinus radiographs were taken in 77 patients and were read blindly a single radiologist who was unaware of clinical conditions of patients. Allergy skin prick tests were performed with a panel of common aeroallergens in Thailand.*

Results: *Age range of the 100 patients were between 1.7 to 12.4 years with a mean (± SD) of 6 ± 2.72 years. History of atopic disease among patients and their families was positive in 49 % and 47% respectively. Four most common clinical manifestations were rhinorrhea (95%), nocturnal and productive cough (91%), nasal congestion (74%) and posterior nasal dripping (66%). The three most common signs were obstruction of middle meatus (100%), swelling of turbinates (92%) and granular pharynx (48%). All paranasal sinuses X-rays were abnormal with maxillary sinus being the most commonly involved sinus (99%) followed by ethmoid sinus (91%). The majority of patients had involvement of more than one sinus. Skin prick tests were positive in 53.6%. The two most common sensitizing allergens were dust mites (57.7%) and cockroaches (18.6%).*

Conclusion: *The presence of symptoms of rhinorrhea, cough, nasal congestion and posterior nasal drip should alert physicians for diagnosis of sinusitis in pediatric patients. Maxillary and ethmoid sinus were the most common sinuses involved. Atopic predisposition is present in up to 53.6% in this population.*

Keywords: *Sinusitis, Childhood, Atopy, Maxillary sinus, Ethmoid sinus.*

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Sinusitis is a common complication found among children with upper respiratory tract infections (URI) with its occurrence estimated approximately 5-10% among such cases[1]. In a recent study, sinusitis accounted for approximately 20 % office visit to specialists[2]. Despite this fact, sinusitis is one the frequently overlooked conditions in pediatric practice. Clinical presentations of sinusitis in children differed markedly from adult patients[3]. For instance, cough and rhinorrhea are the hallmark symptoms in children with sinusitis whereas headache and facial pain are frequent complaints in adults[3].

Underdiagnosis of acute sinusitis could lead to the development of chronic sinusitis which has been previous shown to be associated with enormous of health care expense in the USA (up to 5.8 billion US$ per year)[4]. In addition, early diagnosis could prevent complications associated with sinusitis such as mas-

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toiditis and spreading of infections into intracranial cavities[5]. The most common precipitating factors for sinusitis are upper respiratory tract infection and allergy[6,7]. To distinguish sinusitis from allergic rhinitis and other etiology causing persistent upper respiratory tract infections is a great challenge for practitioners caring for children.

There are limited studies on childhood sinusitis in Thailand[8]. We, therefore, conduct a prospective study to 1) to characterize clinical manifestations of children with clinical diagnosis of sinusitis, 2) to determine the association between the occurrence of sinusitis and allergy among these affected children.

Material and Method

Patients

Children with clinical diagnosis of sinusitis (ages between 1-15 years) were recruited from the pediatric allergy clinic, pediatric outpatient clinic and pediatric ENT clinics of the Siriraj hospital between September 2001 to June 2002. Physical examination and anterior rhinoscopy were performed by responsible investigators. Clinical sinusitis was defined by the presence of thick, purulent nasal discharge visualized at middle meatus with a modified anterior rhinoscopy with otoscope and speculum)[9].

Patients and their families were interviewed by one of the investigators using a locally developed sinusitis record form. Multiple variables in questionnaire were used to describe demographic data, past medical history, personal and family history of allergic diseases, and other otolaryngologic problems. Symptoms, signs, duration of illness and exposure to adverse environmental factors such as cigarette smoking and also pets' ownership were recorded. Definitions of sinusitis by duration are as follows: a) acute sinusitis-symptoms less than 4 weeks and b) chronic sinusitis-symptoms longer than 4 weeks[10]. Thus, subacute sinusitis under some definition was included with chronic sinusitis in our study[11].

Allergy skin prick test (SPT)

SPT was performed in whom inform consent could be obtained. SPT was performed on the back or on the volar surface of forearm using standard method[12]. A local panel of common aeroallergens (Center Laboratories, Port Washington, NY) to Thailand was used[13]. Histamine (10 mg/ml) and glycerinated control were used as positive and negative control. Reactions to controls and allergens were read at 10 and 15 minutes, respectively. Positive results were considered when wheal sizes were equal to or greater than 3 mm over wheal size from the negative control.

Sinus radiographs

Antero-posterior, occipitomental (Water's view) sinus X-rays wereperformed at time of diagnosis from all patients; however, only 77 of these X-rays were available by review by the radiologist. Lateral skull X-rays were taken in patients suspected to have adenoid hypertrophy and in patients whose ages greater than 5 years.

All radiographic films were read by a single radiologist who was blind to clinical information of the patients. The criteria for radiographic diagnosis of sinusitis were: 1) mucosal thickness $\geq$ 4 mm., 2.) total opacification, or 3) the presence of air fluid level in any of the paranasal sinuses[14].

Statistical analysis

Data were entered into the spreadsheet of the SPSS program (SPSS, Chicago, ILL) and were analyzed with a descriptive module of the program. Comparison of symptoms between the acute and chronic group were performed using Chi Square test. Significance level was $p < 0.05$, by two-tailed test.

Results

Demographic data:

Total patients enrolled into the study were 100 patients (61 boys and 39 girls). Their mean age ($\pm$ SD) was 6 $\pm$ 2.7 years. Sixty-nine patients were classified as having acute sinusitis and 31 patients had chronic sinusitis. Other demographic data of the patients are shown in Table 1.

Clinical symptoms and signs:

The most common symptoms were rhinorrhea (95 %), cough (91%), nasal nasal blockage (74%) and postnasal drip (66%) as shown in Table 2. Snoring and bad-breath were reported in 47% and 37% of cases, respectively. Interestingly enough, 33 patients presented with wheezing; however, this was documented by physical examination in only 7%. Fever and sore throat were present in less than a quarter of patients (23% and 21%). Other symptoms less frequently reported were earache (11%), epistaxis (7%) and facial swelling (6%).

For characteristics of nasal discharge, thick discharge was reported in 28 patients (29.5%), purulent discharge in 20 patients (21%), clear discharge in 11 patients (11.6%) and variable types in 36 patients (37.9%).

Table 1. Demographic data of 100 patients enrolled into the study

Age in years(mean ± SD)		6 ± 2.7	
Age range (years)		1.7 - 12.4	
Sex: male:female		1.6:1	
Duration of illness		Number of patients	
- Acute less than 7 days		15	
- Acute (7 days- 4 weeks)		54	
- Chronic (over 4 weeks)		31	
Source of patients		Acute sinusitis	Chronic sinusitis
- Allergy clinic	52 cases	40 cases	12 cases
- Pediatric OPD	37 cases	23 cases	14 cases
- Pediatric IPD	4 cases	1 cases	3 cases
- ENT clinic	7 cases	5 cases	2 cases
Family Hx of atopy:			
- one parent		41 (41%)	
- both parents		5 (5%)	
Smoking exposure		39 (39%)	
Exposure to furred pets		27 (27%)	

Table 2. Symptoms and signs observed

Symptoms	%	Signs	%
Rhinorrhea	95	Obstruction of middle meatus	100
Cough	91	Turbinate swelling	92
Nasal blockage	74	Granular pharynx	48
Posterior nasal drip	66	Enlarged tonsils	34
Snoring	47	Posterior nasal drainage	31
Bad breath	37	Fever	23
Wheeze	29	Enlarged cervical lymph node	12
Headache	27	Wheezing	7
Fever	23	Facial tenderness	6
Sore throat	21	Inflamed eye drums	6
Earache	11		
Epistaxis	7		
Facial swelling	6		

Among 91 patients reporting the presence of coughing, 63 patients reported only nocturnal cough whereas 22 patients reported cough during both days and night (more prominent during night time) and 6 patients reported day-time cough only. Coughing was productive in 78 patients and non-productive in 13 patients.

Since the presence of meatal discharge was our prerequisite physical findings for sinusitis, this finding was present in all patients. Other common physical findings were mucosal swelling of nasal turbinates (92 %) and granular pharynx (48 %). Enlarged tonsils and posterior nasal discharge was observed in 34 and 31 patients. Other less frequently observed physical findings were enlarged cervical lymph nodes

(12 patients), wheezing (7%), facial tenderness (7%) and inflamed tympanic membrane (6%).

Comparison of symptoms/signs between the acute and chronic groups was not statistically significant ($p > 0.05$).

Radiographic results:

Radiographic appearances of SXR from 77 patients available for review, were all abnormal with 76 had bilateral sinusitis. Maxillary sinuses were the most common sinuses involved (76/77, 99%) followed by ethmoid sinuses (70/77, 91%). Ninety percent of patients had more than one sinus involvement. The distribution of sinuses involved is tabulated in Table 3. Lateral skull X-rays were performed in 63 patients; among these, 56 (89%) had evidence of adenoid hypertrophy.

History of allergy:

Fourty-eight patients (48%) reported personal allergic diseases with allergic rhinitis in 18% and asthma in 16%. Details of personal allergic history are shown

Table 3. Frequency of sinuses involved

Sinus	%
Maxillary + Ethmoid sinuses	63
Maxillary sinus alone	7
Maxillary + Ethmoid + Sphenoid sinuses	4
Ethmoid sinus alone	1
Maxillary + Ethmoid + Frontal sinuses	1
Maxillary + Ethmoid + Sphenoid + Frontal sinuses.	1

Table 4. Associated personal atopic diseases

Atopic diseases	Acute sinusitis Cases (%)	Chronic sinusitis Cases (%)	Total (100) (%)
Allergic rhinitis	15/69 (22%)	3/31(10%)	18
Asthma	14/69 (20%)	2/31 (7%)	16
Atopic dermatitis	1/69 (%)	0/31	1
Allergic rhinitis + Asthma	10/69 (15%)	3/31 (10%)	13
Total	40/69	8/31	48

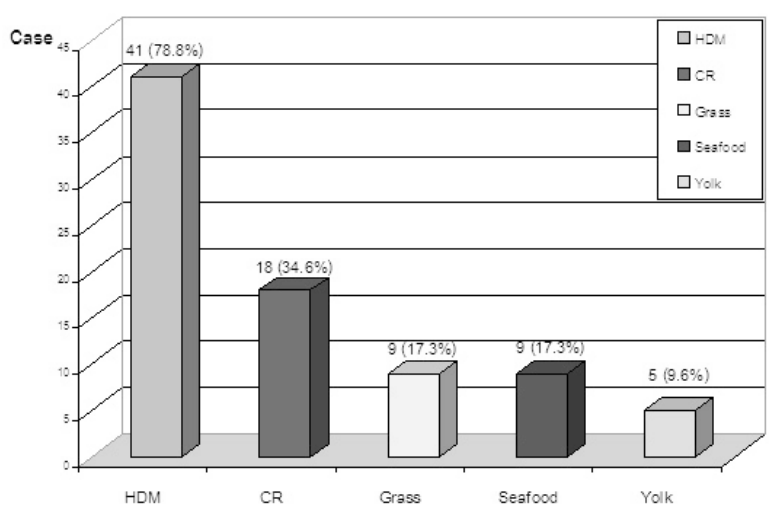

Fig. 1 Types of allergen sensitized by patients in the study. (HDM = house-dust mites, CR = cockroach)

in Table 4. Maternal history of allergic diseases was recorded in 26 patients (26%) and paternal history of allergic diseases in 20 patients (20%).

Skin prick test:

Ninety-seven patients underwent skin prick testing. Positive skin test results to at least 1 allergen were found in 52/97 patients (53.6%). Percent of positive SPT in acute cases (36/66, 55%) was similar to those in chronic cases (16/31, 52%, p = 0.7, Chi-Square test). The 3 most common aeroallergens were dust mite (41/52; 78.8%), cockroach (18/52; 34.6%) and grass (9/52; 17.3%) as shown in Figure 1.

Discussion:

Sinusitis is a very common problem in pediatrics and can be found in children of all age groups[15]. Diagnosis of sinusitis in children can be difficult since presenting symptoms could be subtle and confused with chronic rhinitis from other causes. Common symptoms of sinusitis found in our study (rhinorrhea, cough and nasal blockage) are similar to studies conducted from Western countries[3,11]. These symptoms could mislead pediatricians to diagnosis other than sinusitis, such as allergic rhinitis and infections of lower respiratory tract. The presence of posterior nasal drip along with the three symptoms should alert physicians of sinusitis.

Despite the fact that a large majority of our patients were categorized in the 'acute' group, symptoms and signs indicating the acuity of symptoms such as fever, tenderness of the forehead, headache, earaches and other signs such as inflammation of posterior pharyngeal wall and of eardrums were relatively uncommon in our study. In fact, there was no statistical distinction between the acute vs. chronic groups in terms of symptoms and signs recorded in our study.

The high rate of atopy by history (48%) and by skin testing (53%) among subjects in our study reflected a bias in patients recruitment with majority of cases recruited from pediatric allergy clinic (52 patients). Nevertheless, the rate of atopy among our patients was higher than that found among normal Thai children (approximately 30% -Vichyanond, unpublished data). Therefore, atopy could be a risk factor for the development of sinusitis. Such predisposition has been shown in previous studies among children with sinusitis such as that by Ngugen et al (59%)[1], Rachelsky et al (51%)[6], Iwen et al (61%)[16], Shapiro, et al (40%)[17] and Prasertchoung et al (65%). Frequency of allergic rhinitis in our sinusitis patients (31%) and asthma (29%) were lower than that reported by earlier study by Prasertchoung in Thai population (55% and 48%)[8], but was similar to that found by Ngugen et al (asthma, 25.3%). It is interesting that 23 children in our study presented with wheezing (confirmed by auscultation in only 6 children), indicating an intimate relationship between sinus infection and bronchospasm[18-20]. Evaluation and treatment of associated atopic diseases would yield beneficial information and would improve outcome of sinusitis treatment.

In our study, SXRs were used as confirmatory tests for the presence of sinusitis. We realize SXR has limitation in diagnosing childhood sinusitis due to its unacceptable rates of false positives and false negatives[9]. However, the high cost of computerized tomography of paranasal sinuses precludes the use of this examination as a gold standard for diagnosing sinusitis in developing countries such as in Thailand. The most common sinus involved in our study was maxillary sinus followed by ethmoid sinus with a large majority of cases involving more than one sinus. Our findings corroborate with those by Visitsuntorn[18] and by Zimmerman[21].

Conclusion

The four most common symptoms of childhood sinusitis in this study were rhinorrhea, cough, nasal congestion and posterior nasal drip. The presence of the aforementioned symptoms should alert pediatricians to a diagnosis of sinusitis. Since approximately half of our subjects were atopic by history and by skin prick testing, allergic evaluation among sinusitis patients, particularly those with chronic symptoms may be warranted.

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การศึกษาถึงลักษณะทางคลินิกของผู้ป่วยเด็กด้วยโรคไซนัสอักเสบที่มารักษาที่โรงพยาบาลศิริราช

จิรพรรณ ตันติมงคลสุข, สุวรรณา พรรัตนรังสี, ปกิต วิชยานนท์

คำนำ: *โรคไซนัสอักเสบเป็นโรคที่พบได้บ่อยทั้งในประเทศไทยและในต่างประเทศ การศึกษาเกี่ยวกับรายละเอียดของโรคไซนัสอักเสบในเด็กไทยยังมีอยู่น้อย การศึกษาครั้งนี้เป็นการศึกษาถึงอาการและอาการแสดงของผู้ป่วยเด็กไทยด้วยโรคไซนัสอักเสบที่เข้ามารับการรักษาที่โรงพยาบาลศิริราช รวมไปถึงศึกษาว่าผู้ป่วยในกลุ่มนี้มีแนวโน้มของการแพ้ได้บ่อยเพียงไร*

วัสดุและวิธีการ: *ได้ศึกษาผู้ป่วยเด็กที่ได้รับการวินิจฉัยว่าเป็นโรคไซนัสอักเสบโดยการตรวจว่ามีหนองที่ middle meatus จาก anterior rhinoscopy จำนวน 100 ราย จากคลินิกโรคภูมิแพ้เด็ก (52 ราย) คลินิกเด็กป่วย (36 ราย) และโรคหู คอ จมูก เด็ก (7 ราย) ของภาควิชากุมารเวชศาสตร์ และภาควิชาโสตนาสิกและลาริงซ์วิทยา คณะ แพทยศาสตร์ศิริราชพยาบาล ผู้ป่วยทุกรายได้รับการถ่ายรังสีของโพรงไซนัส แต่มีเพียง 77 รายที่ได้รับการแปล ผลจากรังสีแพทย์ซึ่งไม่ทราบถึงอาการของผู้ป่วย ในผู้ป่วยที่ได้รับการยินยอมจะได้รับการตรวจภูมิแพ้ทางผิวหนัง ต่อสารก่อภูมิแพ้*

ผลการศึกษา: *อาการที่พบได้บ่อยที่สุด 4 อาการในผู้ป่วยเหล่านี้ได้แก่ อาการน้ำมูกไหล (ร้อยละ 95) อาการไอ (ร้อยละ 91) อาการแน่นจมูก (ร้อยละ 74) และอาการเสมหะไหลลงคอ (ร้อยละ 66) อาการไข้พบได้ร้อยละ 23 และอาการหายใจมีเสียงวี้ดร้อยละ 29 สำหรับอาการแสดง พบว่ามีการบวมและอุดตันของ middle meatus ร้อยละ 100 อาการบวมของ turbinates ร้อยละ 92 การอักเสบของคอร้อยละ 48 การบวมของทอนซิลร้อยละ 34 และมีน้ำมูกไหลลงคอร้อยละ 31 อาการและการแสดงอย่างอื่นพบได้น้อย พบว่าไซนัสเอกซเรย์ของผู้ป่วยทั้ง 77 รายที่ได้รับการแปลผลจากรังสีแพทย์มีความผิดปกติ โดยความผิดปกติของ maxillary sinus พบได้บ่อยที่สุด (ร้อยละ 99) ตามมาด้วย ethmoid sinus (ร้อยละ 91) โดยผู้ป่วยส่วนใหญ่มีความผิดปกติในไซนัสมากกว่า 1 แห่ง โดยพบการอักเสบของ maxillary ร่วมกับ ethmoid sinus ได้บ่อยที่สุด (ร้อยละ 80) ผู้ป่วย 97 รายได้รับการตรวจภูมิแพ้โดยวิธีสะกิดผิวหนัง และพบว่ามีผู้ป่วย 52 ราย (ร้อยละ 53.6) แสดงอาการแพ้ โดยสารแพ้ที่พบว่าทำให้เกิดการแพ้ได้บ่อยที่สุด ได้แก่ สารแพ้จากไรฝุ่น (ร้อยละ 57) และสารแพ้จากสะเก็ดแมลงสาบ (ร้อยละ 18.6)*

สรุป: *อาการน้ำมูกไหลประกอบกับอาการไอ แน่นจมูกและเสมหะไหลลงคอเป็นอาการที่บ่งชี้ถึงการเกิดไซนัสอักเสบในเด็ก โพรงไซนัส maxillary และ ethmoid เป็นโพรงไซนัสที่เกิดการอักเสบได้บ่อยที่สุด ผู้ป่วยร้อยละ 53 มีแนวโน้มของการแพ้ โดยสารแพ้จากไรฝุ่นเป็นสารแพ้ที่ทำให้เกิดสารแพ้บ่อยที่สุด*