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# Prevalence of orbital complications in acute rhinosinusitis

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***Abstract***

***Background:*** *Orbital complications can occur in patients with acute rhinosinusitis, ranging from simple eyelid edema (preseptal cellulitis), which is the commonest, to vision and life threating conditions like orbital abscess and cavernous sinus thrombosis. Accurate early diagnosis is essential.*
***Aim of study:*** *To evaluate the prevalence of orbital complications of acute rhinosinusitis.*
***Patient and methods:*** *A prospective study was carried out at Otorhinolaryngology department at Ghazi Al-Hariri Surgical Specialties Hospital, Medical City Complex, Baghdad during period from January 2013 to December 2014. Cases already diagnosed as acute rhinosinusitis where included in the study, then cases with orbital complications were selected, clinically and radiologically evaluated, then classified into two groups according to their ages. First group was below 18 years, other group above 18 years. Types of complications, site and sinus involved and clinical presentation were compared in each group.*
***Results:*** *A total number of patients were (568). Orbital complications were present in (34) patients (6.0%). Twenty patients (58.8%) were children, (15) had preseptal cellulitis, (3) orbital cellulitis, (2) had orbital abscess. Preseptal cellulitis was the commonest complication in children. Fourteen patients were adults (41.2%), (6) with subperiosteal abscess, (4) with preseptal cellulitis, (2) with orbital cellulitis, (2) with orbital abscess. Subperiosteal abscess was the commonest complication in adults.*
*Commonest isolated sinus infection was ethmoid, sphenoid was the least affected. While maxillary and ethmoid affection were the commonest mixed sinus involved.*
***Conclusion:*** *Orbital complications of acute rhinosinusitis are not uncommon, being more common in children than adults.*

***Keywords:*** *Orbital complications, acute rhinosinusitis, preseptal cellulitis,orbital cellulitis, subperiosteal abscess.*

## Introduction

The close proximity of the orbit to the paranasal sinuses, especially the ethmoid sinuses, makes it the most commonly involved structure in complications of sinusitis [(!)].

Children appear to be more prone to orbital complications of sinusitis, probably because of their relatively higher rates of upper respiratory tract infections and sinusitis [(2)]. Gender has not been identified as a risk factor in orbital complications of sinusitis [(3)].

Orbital involvement primarily results from a thrombophlebitis and interference with the venous drainage of the orbital contents [(4)]. The superior and inferior ophthalmic veins are valveless, allowing direct communication between the nose, ethmoid sinuses, face, orbit, and cavernous sinus. In addition, congenital or other dehiscences in the lamina papyracea, which separate the ethmoid sinuses from the orbit, expose the orbital contents to direct extension of sinusitis [(5)].

The combination of phlebitis and direct entry of bacteria into perivascular structures results in what is generally a continuum of inflammatory and infectious changes [(6)].

The orbital periosteum, the periorbita, is an important structure because it is the only soft tissue barrier between the sinuses and the orbital contents. It comprises loose fibrous tissue that can be easily elevated off the underlying bone. The orbital septum is a reflection of the periorbita at the margins of the orbit and it passes centrally to fuse with the tarsal plates [(7)]. The orbital septum lacks lymphatic channels and thus forms a barrier limiting infections from passing directly through the eyelids into the orbit [(8)]. Orbital infections are divided into two groups based on this element of orbital anatomy, preseptal and postseptal infections [(9)].

*Chandler et al* had classified the orbital complications of sinusitis into five groups; preseptal cellulitis, orbital cellulitis, subperiosteal abscess, orbital abscess, and cavernous sinus thrombosis [(10)]. The first complication,

preseptal cellulitis is a preseptal infection and the latter four are postseptal. Although often thought of as a continuum, each of these complications should be considered separately. These infections are not exclusive and multiple complications can occur in the same patient [11].

| Chandler Type | Typical findings |
|---|---|
| Type I (Preseptal cellulitis) | Edematous, erythematous eyelids Extraocular muscles (EOM) intact Normal vision |
| Type II (Orbital cellulitis) | More diffuse orbital edema ± Impaired EOM. Usually normal vision until later in disease course |
| Type III (Subperiosteal abscess) | Edematous, erythematous eyelids; Proptosis impaired EOM Usually normal vision, esp. in the case of small abscesses Visual changes more likely with larger abscesses |
| Type IV (Orbital abscess) | Severe exophthalmos, chemosis, Ophthalmoplegia, common Visual impairment, common |
| Type V (Cavernous sinus thrombosis) | Bilateral orbital pain, chemosis, proptosis Ophthalmoplegia, CN III, IV, VI, V2, V3, VI can be affected |

**Patients and method**

A prospective study was carried out at Otorhinolaryngology department at Ghazi Al-Hariri Surgical Specialties Hospital, Medical City Complex, Baghdad during period from January 2013 to December 2014.

During this period patients were selected from clients who visit Otorhinolaryngology outpatient clinic either directly or referred from orbital clinic, neurosurgery department and medical word.

Only cases of acute rhinosinusitis where included in the study. The diagnosis of acute rhinosinusitis was clinical in majority of cases. We depend clinically on diagnostic criteria as the symptoms of Rhinosinusitis divided into major (purulent nasal drainage, nasal congestion, facial pressure or pain, decrease smell) and various minor symptoms. Presence of two major or one major and two minor symptoms then patient diagnosed to have rhinosinusitis.

From temporal point of view all our patients found to have acute rhinosinusitis as their symptoms last less than four weeks. Cases of chronic rhinosinusitis whether polypoidal or non polypoidal, acute fungal rhinosinusitis, cases with neurological complication due to sinusitis and all immunocompromised patients were excluded from the study.

For all of complicated cases full history including age, gender occupation, residence, duration of eye symptoms and side affected, detailed nasal symptoms, detailed past medical surgical, family and drug history was taken.

Clinical presentation was assessed according to the presences of (eye lid edema, chemosis, proptosis, impaired vision and restricted mobility of globe). Full ENT examination with endoscopic nasal evaluation was done.

All patients have CT scan performed at initial presentation, according to CT finding sinus affected; presence of lamina papyracea erosion, presence of subperiosteal abscess, displaced globe and diffuse edema of the orbit. MRI was obtained to patients if intracranial complications were suspected. Ophthalmological, neurological and medical consultations were done for each patient. Ophthalmic examination included: visual acuity, colour vision, anterior and posterior segment examination and extraocular mobility examination. Based on clinical and radiological findings, the patients were classified them into five groups (according to Chandler classification).

Patients were classified into two groups. First group involved children below 18 years and second group involved adults older than 18 years.

Type of complications, clinical manifestation, sinus involved, site distribution of sinusitis and the frequency of each were compared in each group. P-value was used to determine statistical significance between the frequency of orbital complication in children and adult and considered significant when p value less than 0.05.

**Results**

*Number of patients:* Total (568) of patients having acute rhinosinusitis were included in the study.

*Orbital complications:* were found in (34) patients (6.0%).

*Age:* Range from 2 to 70 years with mean age of (21.2 years).

*Age distribution:* (20) patients were children (58.8%) and (14) patients were adults (41.2%).

*Gender distribution:* (22) were males and (12) were females.

*Side affected:* Right side was involved in (23) patients, while left involved in (11) patients. Ratio 2.1**:**1**.**

*Distribution of orbital complications:* Most common orbital complication was preseptal cellulitis seen in (19) patient (56 %) followed by sub periosteal abscess seen in (6) patients (17.6%), Orbital cellulitis and orbital abscess (14.7%), (11.7%) respectively.

In children (15) out of (34) patients (44.12%) had preseptal cellulitis,(8.82%) had orbital cellulitis subperiosteal abscess, (5.88%) had orbital abscess. In adults, 17.65% had subperiosteal abscess, 11,76% had preseptal cellulitis, 5.88% had orbital cellulitis, 5.88% had orbital abscess.

Regarding orbital complications, *Chi square* showed statistically high significant difference between children and adults (p –value< 0.05).

**Table 1** Distribution of orbital complications according to Chandler classification

| Chandler Type | Children | Adults | Total |
|---|---|---|---|
| I | 15<br>44.12% | 4<br>11.76% | 19<br>55.88% |
| II | 3<br>8.82% | 2<br>5.88% | 5<br>14.71% |
| III | 0<br>0% | 6<br>17.65% | 6<br>17.65% |
| IV | 2<br>5.88% | 2<br>5.88% | 4<br>11.76% |
| V | 0<br>0% | 0<br>0% | 0<br>0% |
| Total | 20<br>58.82% | 14<br>41.18% | 34<br>100% |
| $X^2$ =11.88, d.f. =3, P-value =0.008(HS) | | | |

*Sinus involvement:* Ethmoid sinus is the most common sinus involved in both groups **(**100**%).** In children, maxillary and ethmoid sinusitis (35.29%), isolated ethmoid sinus involvement seen in (23.53%) of patients. Neither frontal nor sphenoid sinus affection was detected.

In adults, maxillary and ethmoid affection was found in (8.82%) maxillary, ethmoid and frontal sinusitis in (11.76%), isolated ethmoiditis in (11.76%) and pan sinusitis in (8.82%).

Regarding site distribution of rhinosinusitis, Chi square showed statistically high significant difference between children and adults (P value <0.05).

**Table 2** Distribution of orbital complications according to sinus involvement

| Sinus involved | Children | Adults | Total |
|---|---|---|---|
| Ethmoid only | 8<br>23.53% | 4<br>11.76% | 12<br>35.29% |
| Maxillary + ethmoid | 12<br>35.29% | 3<br>8.82% | 15<br>44.12% |
| Maxillary + ethmoid + frontal | 0<br>0% | 4<br>11.76% | 4<br>11.76% |
| Maxillary + ethmoid + frontal + sphenoid | 0<br>0% | 3<br>8.82% | 3<br>8.82% |
| Total | 20<br>58.825% | 14<br>41.18% | 34<br>100% |
| $X^2$ =13.802, d.f. =3, P-value =0.004(HS) | | | |

Sinus involvement according to CT-scan findings

Ethmoid sinus was affected in all patients (i.e. 34 out of 34), being (20) children (58.82%) and 14 patients (41.18%) were adults. Maxillary sinus affection seen in (21) of patients, (12) of them were children (57.14%) and (9) were adults (42.86%). Frontal sinus was affected in (7) patients, all (100%) of them were adults, none of children develop frontal sinusitis (0%). Sphenoid sinus was affected in 3 adults , none of children develop sphenoid sinusitis.

From a statistical point of view regarding frequency of each sinus affection, Chi square showed high statistically significant difference between children and adults. P-value < 0.05.

**Table 3** Sinus involvement according to CT-scan findings

| Sinus | Children | Adults | Total |
|---|---|---|---|
| Ethmoid | 20<br>58.82% | 14<br>41.18% | 34<br>100% |
| Maxillary | 12<br>57.14% | 9<br>42.86% | 21<br>100% |
| Frontal | 0<br>0% | 7<br>100% | 7<br>100% |
| Sphenoid | 0<br>0% | 3<br>100% | 3<br>100% |
| $X^2$ =11.475, d.f. =3, P-value =0.009(HS) | | | |

Regarding orbital manifestations according to Chandler classification, comparison of orbital manifestation in children high statistically significant difference among that manifestation. P value < 0.05.

In adults, comparison of orbital manifestations shows no significant difference among that manifestation. P value more than 0.05.

**Table 4** Orbital manifestations according to Chandler classification

| Chandler Type | Total No. | Eyelid Edema | | Chemosis | | Proptosis | | Limited EOM | | Impaired vision | | Visual Loss | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C | A | C | A | C | A | C | A | C | A | C | A |
| I | 19 | 15 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| II | 5 | 3 | 2 | 3 | 2 | 0 | 2 | 0 | 2 | 1 | 0 | 1 | 0 |
| III | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 4 | 1 | 1 | 0 | 1 |
| IV | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 0 |
| V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 20 | 14 | 5 | 10 | 2 | 10 | 2 | 8 | 3 | 3 | 1 | 1 |
| Total | | 34 | | 15 | | 12 | | 10 | | 6 | | 2 | |

C = Children A = Adults

Comparison of orbital manifestation in children X2=27.431, d.f. = 10 , P-value = 0.002 (HS). Comparison of orbital manifestation in adults X2 = 14.806, d.f. = 15 , p-value = 0.465 (NS).

**Discussion**

In our study, orbital complications found in (6%) of patients with acute rhinosinusitis and that agreed with Radovani (BALKAN)[13] (7%); Levon 2007 ( 6% )[14]; AlMadani 2013 (5.8%)[15]; Stojanovic J. 2009 (1.35%)[16].
58.8% of our patients were children (below 18 years), the rest were adults. Largest percentage was children and

that agreed with almost all studies; AlMadani[15], Moloney[17], Mortimore[18] and this may contributed to frequency of URTT in children which is higher than adults also development of immune system.

Age range was (from 2 to 70 years) with mean age of (28) years, that agreed with almost all series, Radovani (BALKAN)[13] range was from 3 to 75 with mean 25 years, Awuah Peter (Ghana)[19] range was 1 to 70; Velasco c Cruz(Sao Paulo)[20]1 to 77 years.

In our study, (22) patients were males (64.7%) and (12) were females. As most series, male predominance was found; 68% male by AlMadani[15], 63.8% male predominance found by Awuah Peter[19]; 68% male predominance by Levon[14] and 64% by Radovani[13] The question of why this happens has been repeatedly asked through the years, but there is still no definite explanation for this observation.

Right side was involved in our study in (23) patients, while left in (11), (2.1 :1). And that agreed with most series, while Nwaorgu[21], Swift AC[22], found that left side affected more.

In our study most common orbital complication belong to Chandler classification type I (preseptal cellulitis), that (19 out of 34), (56%) develop that type of complication, Al madani[15]found (72%); Radovani[13] found (42.8%); Velasco e Cruz[20] found (25 %) develop pre septal cellulitis.

The second common complication in our study belong to type III Chandler classification (subperiosteal abscess). We found that (6 out of 34) patients develop subperiosteal abscess, (17.6%), Stojanovic J.[16] Found (26%) develop subperiosteal abscess; Awuah Peter[19] found that 58% develop same complication. Orbital cellulitis was seen in (14.7%) in our study (5 out of 34 ); AlMadani[15] found (22.2%); Radovani[13] found (28.5%); Velasco e Cruz[20] found 46.9 **%** develop orbital cellulitis. Our study showed (11.7%), (4 out of 34) develop orbital abscess, while Velasco e Cruz[20] found (12.1%); Awuah Peter[19] (9%); and Radovani[13] ( 8.5%).

None of our cases develop cavernous sinus thrombosis, that agreed with Velasco e Cruz[20] , AlMadani[15]; while Radovani[13] found 1 out of 35 (2.8%); Awuah Peter[19] found 2 out of 36 patients( 5.5%).

Regarding orbital complications, in our study $X^2$ shows statistically high significant difference between children and adults (P-value less than 0.05) and that agreed with AlMadani[()] as they found that the frequency of development of orbital cellulitis and abscess were statistically significant between children and adults (P-value less than 0.05). These findings support that sinusitis related complications tend to occur in children but severe involvement are commoner in adults.

Most common sinus involved in our study was ethmoid sinus (100%), and that agree with Tarek Hamdy (Egypt)[24] (100%) , Chavan (India)[25] (100%); Awuah peter[19] (94%), while Levon[14] found maxillary sinus is the commonest (80%).

In our study mixed sinus infection (maxillary and ethmoid) was most commonly seen in (44.12%); Hamdy[24] found that maxillary and ethmoid and frontal (40%); AlMadani[15] found maxillary and ethmoid and frontal (27.7%); Chavan[25] found maxillary and ethmoid and frontal (20%). While in our study maxillary and ethmoid and frontal seen in (11.76%). In our study maxillary sinus affected in (21) patients (61.7%), Hamdy[24] found that maxillary sinus affected in ( 63%) ; Chavan[25] found that maxillary sinus affected in 45%; Levon[14] found that maxillary sinus seen in (80%).

**Conclusion**

Results from our study allowed us to conclude and recommend that;

1. Orbital complications are not uncommon, being more common in children than in adults.
2. Preseptal cellulitis is the commonest in children, while the subperiosteal abscess is the commonest in adults.
3. Ethmoid sinus is the commonest isolated sinus involved.
4. Maxillary and ethmoid sinusitis is the commonest mixed sinus infection in children, while ethmoid, maxillary and frontal sinusitis is the commonest in adults.
5. The key point in these conditions should be increasing physician awareness towards this problem as well as encouraging early referral to specialized centres for the proper management of these cases.

**References**

[1]. KJ. LEE, Chapter 14, the nose and paranasal sinuses. *Essential Otolaryngology Head & Neck Surgery* , ninth edition , 2008.
[2]. Sited by http: // www.beckerentcenter.comywp-content/uploads/2013/03/scfig3_500.jpg .
[3]. Sited by http: //scienceblogs.com/denialism/wp-content/blogs.dir/428/files /2012/04/i-755eadcffd5efe21 Id642a413e9b6e36-Maxillary%20 sinus.jpg.
[4]. Sited by http: //www.beckerentcenter.com/wp-content/uploads/2013/03 /scfig5_500blue.jpg
[5]. Sited by http:// img.medscape. com/pi/emed/ ckb/emergency_medicine /756148-791704- 1088.jpg
[6]. H Stammberger And Valerie J Lund, Chapter 104,Anatomy of the nose and paranasal sinuses, Scott-BrownsOtolaryngology, Head and Neck Surgery 7th ed , 2008 , p(327).
[7]. Valerie J Lund And Geoffrey E Rose, Chapter 132 , Orbital and optic nerve decompression, Scott-Browns Otolaryngology, Head and Neck Surgery 7th ed,
[8]. Sited by http: //www.cameron.edu/ ~rong/Saladin%20Art/LabExaml/ Skull&CranialNerves/ Fig7_14.jpg
[9]. Sited by. http: //pediatricimaging.wikispaces. eom/file/view/Park-003-PeriorbitalCellulitis2.jpg/ 157226543 / Park-003-PeriorbitalCellulitis2- jpg
[10]. Michael S. Benninger | Janalee K. Stokken Chapter 46/, Acute Rhinosinusitis: Pathogenesis,Treatment and

complications. Cummings Otolaryngology, 6th edition, 2014.Carla M. Giannoni, complication of rhinosinusitis, Bailey s Head

[11]. and Neck Surgery Otolaryngology 5th ed 2014 volume 1 .Axial CT image shows ethmoid sinusitis with orbital cellulitis, A Ali, M Kurien , S S Mathews, J Mathew, Complications of acute infective rhinosinusitis: experience from a developing country, Singapore Med J 2005; 46(10) :p. 542.

[12]. Pjerin Radovani, Dritan Vasili, Mirela Xhelili, Julian Dervishi, Orbital Complications of Sinusitis , Balkan Med J 2013; 30: 151-4 • DOI: 10.5152/balkanmedj.2013.8005

[13]. Levon Mekhitarian Neto 1, Shirley Pignatari 2' Sergio Mitsuda 3, Antonio Sergio Fava 4, Aldo Stamm, Acute Sinusitis in Children - A retrospective study of orbital complications, Rev Bras Otorrinolaringol 2007;73(1):81 -5

[14]. Mousa Victor Al-Madanil, Ahmed Essa Khatatbeh2, Rania Zaid RawashdehS, Nemer Falah Al-Khtoum, Nabil Radwan Shawag, The prevalence of orbital complications among children and adults with acute rhinosinusitis, Braz J Otorhinolaryngol 2013;79(6):716-9.

[15]. Stojanovic J1, Ilic N, Belie B, Zivic L, Stankovic P, Erdevicki L, Jovanovic S, Acta Chir lugosl. 2009;56(3):121-5.,]Orbital complications of rhinosinusitis.

[16]. Moloney JR, Badham NJ, McRae A. The acute orbit preseptal (periorbital) cellulitis, subperiosteal abscess and orbital cellulitis due to sinusitis. J Laryngol Otol 1987;101(Suppl.l2):l-14

[17]. Mortimore S, Wormald PJ. The Groote Schuur hospital classification of the orbital complications of sinusitis. J Laryngol Otol 1997; 111:719-23

[18]. Awuah Peter1, Duah Issahalq Mohammed2, Results of orbital cellulitis treatment. Journal of Natural Sciences Research www.iiste.org ISSN 2224-3186(Paper) ISSN2225-0921(Online).Vol.2, No.5, 2012.

[19]. Antonio Augusto Velasco e Cruz1, Ricardo Cassiano Demarco2, Fabiana Cardoso Pereira Valera3, Antonio Carlos dos Santos4,Wilma Therezinha Anselmo-Lima5, Regina Maria da SilvaMarquezini, Orbital complications of acute rhinosinusitis: a new classification, Rev Bras Otorrinolaringol 2007;73(5):684-8.

[20]. 0. G. B. Nwaorgu, F. J. Awobem, P. A. Onakoya and A. A. Awobem, Orbital cellulitis complicating sinusitis: a 15-year review, Nigerian Journal of Surgical Research Vol. 6, No. 1 - 2,2004: 14-16

[21]. Swift AC, Charlton G. Sinusitis and acute orbit in children. J Laryngol Otol 1990; 104:213-216.

[22]. Brook I. Acute sinusitis in children. Pediatr Clin North Am. 2013;60(2):409-24. DOI: http://dx.doi.Org/ 10.1016/ j.pcl.2012.12. 002

[23]. Yasser El-Beltagy, Tarek Abdel Hamid Hamdy , Mohamed Saad Hasaballah, Orbital complications following sinusitis still a problem: Our experience and results, Egyptian Journal of Ear, Nose, Throat and Allied Sciences (2014) 15,189-195

[24]. Shrinivas Shripatrao Chavan, Sunil D.Deshmukh, Vasant G. Pawar, Vaibhav G. Kirpan, Smita W Khobragade, Kaustubh Sarvade, Dasharath M Kothule. Orbital Complications of Sinogenic Origin: A Case Study of 20 Patients, World Articles in Ear, Nose and Throat.