

# Non-Traumatic Chronic Nasosinusitis Disorders: Clinical and Computed Tomodensitometric Aspects in Cotonou in Benin, West Africa

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## Abstract

**Introduction:** Damage to the nasal cavities and sinuses of the face concern many disciplines, especially the specialist in Otorhinolaryngology and Cervical-Facial Surgery (ENT-CFS), since most symptoms have little value to direct the patient towards a precise diagnosis, radiological exploration, including three-dimensional imaging, provides diagnostic, therapeutic and follow-up support. The aim is to study the clinical and computed tomography scan aspects of non-traumatic chronic nasosinusitis disorders at the Teaching University Hospital of Hubert Koutoukou Maga (CNHU/HKM) in Cotonou. **Material and Method:** It was a descriptive and analytical study with retrospective collection, carried out over a period of 36 months from January 1st, 2014 to December 31st, 2016; on 261 files of patients seen in Otorhinolaryngology (ENT) and Cervico Facial Surgery (CFS) consulting for a chronic nasosinusitis disorder with no trauma notion and having performed a CT scan. **Results:** Chronic lesions of the nasal sinus cavities accounted for 13.42% of ENT consultations. There was female predominance with a sex ratio of 0.85. The clinic varied, the most common signs were rhinorrhea (74%), headache (73.6%) and sneezing (38.3%). On computed tomography scan, 225 results were pathological. Sinus backfilling was in the lead with 66.7% followed by mucous thickening with 60.44%, and by bone involvement in 28%. Inflammatory pathologies (82.22%) were on top of the list, followed by pseu-

do-tumoral pathologies (20.9%). The anterior sinus complex was the most affected (56%) with predominance of the maxillary sinuses. **Conclusion:** chronic nasosinusitis disorders are frequent in daily practice, with a varied clinic. Computed tomography scan is a major diagnostic tool that should be favored.

### Keywords

Chronic Nasosinusitis Disorder, Computed Tomography, CNHU/HKM, Cotonou

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## 1. Introduction

The management of the nasal cavities and sinuses diseases requires clinical and paraclinical specialties. Nasosinusitis pathologies are on top of the list of Otorhinolaryngology diseases [1] [2] and their prevalence varies from one country to another. They reached 37.98% in Guinea in 2014 [1] and 38.65% in Senegal in 2017 [3].

Their impacts on social, economic, physical and psychological life are considerable, especially when the disease is chronic [4] [5]. The management of Chronic Inflammatory Rhino-Sinusitis (CRS) alone is estimated at 8.6 billion dollars (\$) per year in the USA [6]. If they can be detected clinically, imaging is necessary to determine the lesions and their topography. Computed tomography (CT) has shown to be a non-invasive and reliable means of exploring nasal cavities and sinuses [7]. It helps to have a precise lesion assessment and search for the underlying anatomical factor of chronicity. The current study evaluated the prevalence of non-traumatic chronic sinusitis diseases, their clinical and computed tomography aspects at the Teaching University Hospital of Hubert Koutoukou Maga (CNHU/HKM) in Cotonou. Similar studies have been carried out, but they have been generally focused on nasosinusitis ENT pathologies including trauma, either only on posterior damage, or only on clinical and epidemiological aspects.

## 2. Material and Methods

This was a descriptive and analytical study with retrospective collection from January 1st, 2014 to December 31st, 2016. We included patients with non-traumatic chronic nasal sinus conditions that last more than 12 weeks who had consulted in the department of ENT and Cervico and Facial Surgery (CFS) during the period of study at the CNHU/HKM. The sampling was exhaustive. The medical records included clinical data and the CT report. The computed tomography images were obtained using the Emotion Siemens Somaton 16-bar scanner started in December 2013. These CT images were retrieved and then reinterpreted by a radiologist with consideration of all the anatomical variants. The variables studied were socio-demographic, clinical and computed tomography data

namely the age, sex, clinical data including functional and physical signs, data from computed tomography which are the lesions found and their characteristic aspects. We reviewed and counted all the patients' consultation sheets from 2014 to 2016 in ENT department, and the patients' records with nasosinusal disease were retained provided that they met the above-mentioned inclusion criteria. In addition, we performed a review of the CT scans. The results of the anatomopathological examination were recorded in the medical files for cases that had undergone surgery or biopsies. This information was collected using a survey form that had been drawn up beforehand. Data entry, processing and statistical analysis were performed using Epidata 3.1 and SPSS version 22.0 software. The significance threshold was set at 5%.

### 3. Results

During the period of study, we collected 7412 files, including 995 patients, accounting for a prevalence of 13.42% with non-traumatic chronic involvement of the nasal cavities and sinuses. Among them, 261 subjects had performed a CT scan of the sinuses, constituting our population of study.

#### 1) Age and sex ratio

Young adults were mostly affected and 19.20% of patients were in the age group of 40 to 49 years old. The average age was  $41.97 \pm 17.45$  years old with extremes of 4 to 86 years old. A higher frequency was found in women with a sex ratio of 0.85 (Figure 1).

#### 2) Clinic

##### *Functional signs* (Table 1)

In addition, a ground of nasal sinus allergy was found in 36.8% of cases.

Rhinorrhea was present in 74%, accounting for 193 patients, of which 26.1% of anterior location, followed by headache in 73.6%, accounting for 192 patients, then nasal obstruction in 60.1%, accounting for 157 subjects, followed by signs of nasal irritation (sneezing in 38.3%, smell disorder in 27.9% and itching in 24.5%).

##### *Physical signs* (Table 2)

Nasal Congestion was the most common physical sign (65.9%; 172 cases), followed by pallor of the pituitary (31.4%; 82 cases) and deviation of the nasal septum (19.2%; 50 cases).

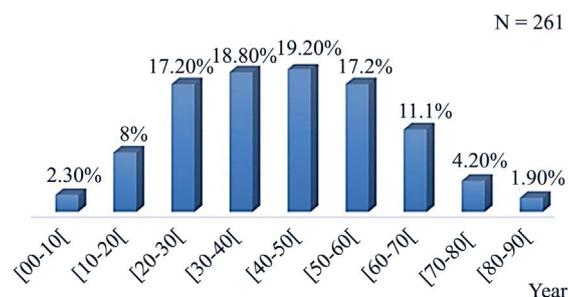


Figure 1. Distribution of patients by age.

**Table 1.** Distribution of patients according to the functional signs.

	Size (S)	Percentage (%)
<b>Rhinorrhea</b>		
Anterior	68	26.1
Posterior	48	18.4
Mixed	77	29.5
<b>Headache</b>	192	73.6
<b>Nasal Obstruction</b>		
Unilateral	39	14.9
Bilateral	46	17.6
A bascule	72	27.6
<b>Sneezing</b>	100	38.3
<b>Smell disorder</b>	73	27.9
<b>Itching</b>	64	24.5
<b>Epistaxis</b>	38	14.6
<b>Facial pain</b>	15	5.7
<b>Paraesthesia</b>	13	5.0
<b>Reflex otalgia</b>	10	3.8
<b>Cough</b>	10	3.8
<b>Eye Pain</b>	6	2.3

**Table 2.** Distribution of patients according to physical signs.

	Size (S)	Percentage (%)
Nasal Congestion	172	65.9
Pallor of the pituitary	82	31.4
Deviation of the nasal septum	50	19.2
Pus in the nasal cavity	38	14.6
Cervical lymph adenopathy	38	14.6
Polyp/Mass of the Nasal cavity	36	13.8
Others*	88	23.7

\*Facial deformation (18; 6.9%); Fever (16; 6.1%); Exophthalmos (12; 4.6%); Mass of oral cavity (11; 4.2%); V involvement (5; 1.9%).

### 3) Computed tomography data

Out of the 261 computed tomography examinations, 225 were pathological; 22 subjects had chronic involvement of the nasosinusitis cavities discovered fortuitously on computed tomography. **Table 3** summarizes the various involvement observed.

The damage to the nasal cavities and sinuses seen on the CT scan were manifold.

Sinus backfilling was the most visualized involvement (66.67%), followed by mucous thickening (60.40%) and bone involvement (28%) with lyses predominance.

**Table 3.** Distribution of nasal sinus lesions objectified by computed tomography.

	Size (S)	Percentage (%)
Backfilling	150	66.67
Mucous tickening	136	60.4
Bone involvement	63	28
Turbinal hypertrophy	34	15.11
Presence of calcification	30	13.33
Enlargement of the middle meatus	14	6.22
Ostial Obstruction	8	3.56
Presence of hydroaeric level	4	1.78
Septal Perforation	1	0.44
Thinning of the nasal septum	1	0.44
Dehiscence/orbital wall	1	0.44

***Diagnoses retained on CT (Table 4)***

Inflammatory involvement accounted for 82.22% including chronic rhinosinusitis, followed by pseudo-tumoral pathologies 19.11% and tumoral 14.2%.

Non-invasive fungal rhino sinusitis dominated, accounting for 10.22% of the infectious inflammatory pathology.

***Location of nasal sinus involvement***

The anterior sinus complex was the most affected (56%) with a predominance of the maxillary sinuses and laterality on the right.

**Figures 2-5** illustrate some aspects of computed tomography.

**Anatomical variants**

Among the 261 computed tomography scans performed, some (N = 88) presented anatomical variants which have been reported in **Table 5**.

The same subject could present several normal variants.

The deviation of the nasal septum was the most common 17.6%, followed by Sinus septum 13.4% and Concha bullosa 10.7%.

**4) Validity of the CT compared to the clinic (Tables 6-9)**

Clinical-CIP crossed on CT Sensitivity = 46.9% Specificity = 68.1% PPV = 64.8% NPV = 50.6%.

The judgments converge (kappa index = 0.145; p-value = 0.014) but of low intensity.

Clinical-IP crossed on CT Sensitivity = 53.8% Specificity = 78.8% PPV = 30.9% NPV = 90.7%.

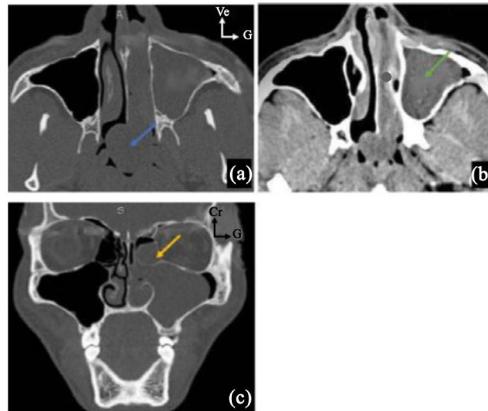
The judgments converge (kappa index = 0.250; p-value = 0.00) but of low intensity.

Clinical-TP crossed on CT Sensitivity = 56.3% Specificity = 99.6% PPV = 94.7% NPV = 94.2%.

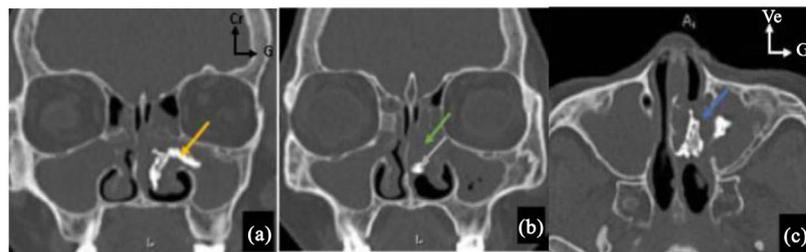
The judgments converge (kappa index = 0.676; p-value = 0.000) but with a strong intensity.

Clinical-STP crossed on CT Sensitivity = 29.8% Specificity = 98.6% PPV = 82.4% NPV = 86.5%.

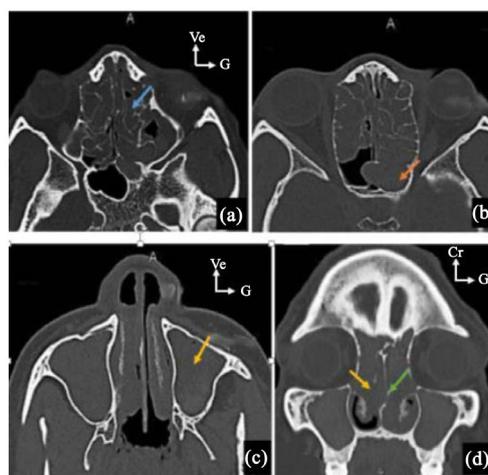
The judgments converge (kappa index = 0.378; p-value = 0.000) but with low intensity.



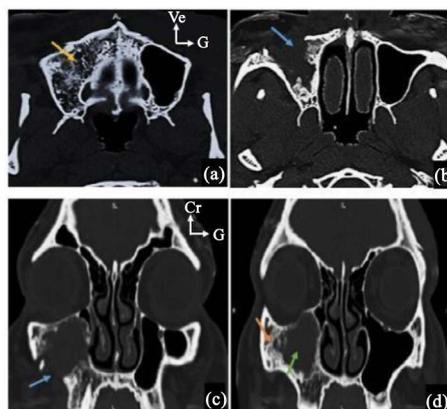
**Figure 2.** Polype antrochoanal of Killian Opacity convex in bissac filling the left maxillary sinus and the left choana. Axial section in bone window (a) and parenchymatous (b) and coronal reconstruction (c).



**Figure 3.** Left anterior aspergillus pansinusitis. Anterior pansinus filling (blue, green arrow) with the presence of coarse calcium inclusion occupying the left ostiomeatal region (yellow arrow). Bone window in coronal reconstruction ((a), (b)) and axial section (c).



**Figure 4.** Nasosinusitis polyposis and inflammatory polyp histology. Bilateral filling of the nasosinuscavities (blue, yellow, orange arrow) with thinning of the partitions of the ethmoid cells and turbinates (green arrow). Bone window, axial section ((a), (b), (c)) and coronal reconstruction (d).



**Figure 5.** Ossifying fibroma confirmed by histology Total filling of the right maxillary sinus (green arrow), heterogeneous rearrangement of the right jaw bone (orange arrow) with bone lyses of the anterior and lateral walls of the maxillary sinus (blue arrow): Axial section ((a) and (b)) and coronal reconstruction ((c) and (d)) in a bone window.

**Table 4.** Distribution of diagnoses retained on the computed tomography.

		Size (N)	Percentage (%)
Inflammatory Pathology	Chronicrhinitis	1	0.44
	Chronic rhino-sinusitis	144	64
	Invasive fungal Rhino sinusitis	4	1.78
Infectious Pathology	Non invasive fungal Rhino sinusitis	23	10.22
	Bacterial Suppuration	13	5.78
	Naso-sinusitis Polyposis	9	4
Pseudo-tumors	Killian's Polyp	7	3.11
	Sinus polyp	12	5.33
	Cyst et pseudo cyst	11	4.89
	Mucocele	4	1.78
Benign Tumors	Fibrous Dysplasia	2	0.89
	Inverted Papilloma	1	0.44
	Osteoma	7	3.11
	Ossifying Fibroma	2	0.89
Malignanttumors + anatomopathology		20	8.89

**Table 5.** Distribution according to anatomical variants.

Variants	Size (N)	Percentage (%)
Deviation of nasal septum	46	17.6
Sinus septum	35	134
Concha bullosa	28	10.7
Sinus agenesis	9	3.4
Sphenoide procidence of internal carotid	7	2.7
Maxillary sinus Hypoplasia	7	2.7
Haller's Cell	6	2.3
Spur of the nasal septum	4	1.5
Pneumatization of the unciform process	3	1.1
Asymmetry of the ethmoidal roof	2	0.8
Enlarged ethmoid bubble	1	0.4
Hypopneumatization of frontal sinuses	1	0.4

**Table 6.** Clinical chronic inflammatory pathology (CIP) crossed on CT.

			CIP-CT		Total
			Yes	No	
Clinical-CIP	Yes	Size	68	37	105
		% in Clinical CIP	64.8%	35.2%	100.0%
		% in CIP-CT	46.9%	31.9%	40.2%
	No	Size	77	79	156
		% in Clinical CIP	49.4%	50.6%	100.0%
		% in CIP-CT	53.1%	68.1%	59.8%
Total	Size	145	116	261	
	% in Clinical CIP	55.6%	44.4%	100.0%	
	% in CIP-CT	100.0%	1000%	100.0%	

**Table 7.** Clinical infectious pathology (IP) crossed on CT.

			IP-CT		Total
			Yes	No	
Clinical-IP	Yes	Size	21	47	68
		% in Clinical IP	30.9%	69.1%	1000%
		% in IP-CT	53.8%	21.2%	26.1%
	No	Size	18	175	193
		% in Clinical IP	9.3%	90.7%	100.0%
		% in IP-CT	46.2%	78.8%	73.9%
Total	Size	39	222	261	
	% in Clinical IP	14.9%	85.1%	100.0%	
	% in IP-CT	100.0%	1000%	100.0%	

**Table 8.** Clinical tumoral pathology (TP) crossed on CT.

			TP-CT		Total
			Yes	No	
Clinical TP	Yes	Size	18	1	19
		% in clinical TP	94.7%	5.3%	100.0%
		% in TP-CT	56.3%	0.4%	7.3%
	No	Size	14	228	242
		% in clinical TP	5.8%	94.2%	100.0%
		% in TP-CT	43.8%	99.6%	92.7%
Total	Size	32	229	261	
	% in clinical TP	12.3%	87.7%	100.0%	
	% in TP-CT	100.0%	100.0%	100.0%	

**Table 9.** Clinical pseudo-tumoral pathology crossed on CT.

			STP-CT		Total
			Yes	No	
Clinical STP					
		Size	14	3	17
Clinical STP	Yes	% in Clinical-STP	82.4%	17.6%	100.0%
		% in STP-CT	29.8%	1.4%	6.5%
		Size	33	211	244
	No	% in Clinical-STP	13.5%	86.5%	100.0%
% in STP-CT		70.2%	98.6%	93.5%	
Total					
		Size	47	214	261
Total		% in Clinical-STP	18.0%	82.0%	100.0%
		% in STP-CT	100.0%	100.0%	100.0%

## 4. Discussion

In our study, the prevalence of non-traumatic chronic nasal sinus disease accounted for 13.31%. The results are similar to those of Samaké *et al.* [8] in 2013 in Bamako which was 12.62% over a period of 6 months. An overall prevalence of nasosinusitis disorders found in Cameroon in 2013 by Njifou *et al.* [2] was 35.24% and 38.65% in Senegal in 2017 by Tall *et al.* [3]. These rates, certainly higher than ours, could be explained by the inclusion of traumatic causes; but conveying the same idea, putting nasosinusitis disorders on top of ENT pathologies.

### 1) Sociodemographic characteristics

Sex ratio was 0.85 with higher frequency in women. The average age was 41.97 ± 17.45 years old with extremes of 4 to 86 years old. The age group of 40 to 49 years old was the most affected in 19.20%. Njifou [2] reported extremes from 1 day to 86 years old, with a predominance of the age group of 16 to 40 years old accounting for 52.09%. Attifi *et al.* [1], in Guinea reported an average age of 33 years old with extremes of 9 months to 73 years old and a predominance of conditions in the age group of 20 to 29 years old. Chronic nasal sinus diseases mainly affect young people, though literature reports age groups below ours. Indeed, other studies have broadened their etiologies to traumatic cause's apanage of young people.

### 2) Clinical data

The clinic was polymorphic, the frequent symptoms were in more or less equal proportion rhinorrhea (74%) and headache (73.6%), followed by nasal obstruction (60.1%). Headache was the main reason for requesting and performing scanner. Finding corroborated by Yekpe Ahouansou *et al.* [9] in 2015 in a study on posterior rhinosinusitis, accounting for 28% of cases. Unlike Adjibabi *et al.* [10] for whom rhinorrhea came first followed by headaches. The essentially clinical nature of his study could explain that order. Nasal congestion was by far the most objectified physical sign (65.9%).

### 3) Computed tomography data

Among the pathological computed tomography examinations, 22 presented a chronic involvement of nasal sinus cavities, fortuitously seen on computed tomography. Stankiewicz *et al.* [11] found in their study that more than half of symptomatic patients (53%) taken in the context of rhinosinusitis had a negative CT scan. There was also no real difference in the severity of symptoms between patients with a positive and negative CT scan. Dubin *et al.* [12] have also reported nearly half of the asymptomatic patients in a population with chronic rhinosinusitis on computed tomography.

Several nasosinusitis lesions can be visualized on computed tomography in the same patient at various degrees. The Sinusitis backfilling was found in 150 patients (66.66%), followed by mucous thickening in 136 patients (60.44%) and bone involvements were found in 63 patients (28%), dominated by bone lysis and osteosclerosis. Studies have shown that almost all patients with purulent discharge from the nasal cavities or the presence of nasal polyps on physical examination have CT images of CRS, while about half of those with mucosal edema and minimal secretions at the clinic have visible sinus involvement [13].

Two hundred and twenty-five CT diagnoses were made. CRS was diagnosed in 144 patients (64%). According to Ndjifou *et al.* [2], rhino-sinusitis was the most frequent pathology in 19.45% (627 patients) of ENT diseases in Douala. Its prevalence in Korea was 6.95% [14]. The overall prevalence of CRS in 2012 was 10.9% in a multicenter study conducted in 12 European countries on adults [15].

Infectious involvement was found in 40 patients (17.8%), mainly fungal infections (12%) retained on the basis of the presence of calcification within a sinus opacity. Aspergillary rhinosinusitis was the most common one. The literature review of Vogiatzi *et al.* [16] revealed a prevalence of 2% in France; it almost exclusively affects adults, with a higher incidence in older patients and a sex ratio of two women for one man. The invasive form of the disease is mainly described in subjects with compromised immunity.

Pseudo-tumoral pathology was found in 19.11% with nasosinus polyps in the forefront, then followed cysts and pseudo cysts. The polyps are relatively common in the literature. Ouedraogo in Burkina Fasso [17], Atifi in Morocco [18], Frosini *et al.* [19] in Italy, Adnane *et al.* [20] and Bozzo *et al.* [21] many more in children. In the literature, recurrence has been frequently described. Cysts and pseudo-cysts are secondary cavities developed within the sinuses and bordered by an epithelial wall unrelated to its content, which may be liquid or semi-liquid [22]. In 9% to 35% of cases according to the literature, these were sequelae of inflammatory damage, particularly dental damage, generally without pathological nature [23] [24].

Among nasosinusitis tumors (14.2%), the benign form was mostly found with the most common sinus cavities osteoma. It is found in 3.1% of cases. However, its incidence is estimated at 0.4% in a series comprising 16.000 sinus images [25]. It is found in the frontal sinus (50%), in the ethmoidal cells (40%) or more rarely

in the maxillary sinus (6%) or sphenoidal (4%); 03 cases of orbital extension have been described in Morocco by Krimissa *et al.* [26] causing orbital and nerve complications.

Among the anatomical variants presumed to be the cause of sinus containment, deviation of the nasal septum was the most common in 17.6% of cases. A Korean study [27] carried out only on adult subjects found it in 44.8% of cases. The prevalence of deviation of the nasal septum with an obstructive symptom was 2.1%. This difference in proportion between the two studies could be linked to the enrolled size (8.845 Koreans). In the literature, the frequency of deviation of the nasal septum would be between 20% and 62% [28]. Frequent associations of variants at risk of containment can promote chronic rhinosinusitis such as conchabullosa and deviation of the nasal septum [29]. No statistical implication was found between the anatomic variants presumed to be at risk of containment and chronic rhinosinusitis according to Smith *et al.* [30]. The frequency of conchabullosa in the literature is higher than 30% [28], compared to this study (10.7%). The presence of conchabullosa and/or septal deviation does not result in the development of maxillary rhinosinusitis [31]. However, their existence deserves to be searched.

From the various validity tests of the computed tomography compared to the clinic, it appears that for the chronic inflammatory pathology with Ss = 46.9%, Sp = 68.1% a PPV = 64.8% and NPV = 50.6%, that for infectious pathology with Ss = 53.8%, Sp = 78.8% PPV = 30.9% and NPV = 90.7% and pseudo-tumor and tumor pathology with respectively a Ss = 29.8%, Sp = 98.6% a PPV = 82.4% and NPV = 86.5%; Ss = 56.3%, Sp = 99.6% a PPV = 94% and NPV = 94.2% the diagnosis with CT keeps the foreground over that done clinically, with converging judgments even with low intensity; except for tumor pathology where the intensity was higher.

## 5. Limitations of the Study

These are those relating to any retrospective recruitment. In some patients, important informations were missing from the medical records that would allow their inclusion in the study; particularly the conclusions of the clinical examination, the results of the scans and the histology. Indeed, the drafting of files is done either by medical students or nurses who unfortunately trivialize certain key aspects of the anamnesis and record keeping. The lack of archiving and data storage in the imaging department made impossible the reinterpretation of some of the images making access to some of the CT images impossible. Like in many countries in the sub-region, access to hospital digitization and archiving systems is still utopian. In addition, some requested scanner and histology examinations have not been carried out due to lack of financial resources. These various aspects have considerably reduced the number of patients included in our study with a low number of scan results found, especially with regard to the study of anatomical variants.

## 6. Conclusion

Nasal cavities and sinuses pathologies are the prerogative of daily medical practice. When they become persistent, they very often require a computed tomography which is a reliable examination of accurate diagnostic and therapeutic orientation.

## Conflicts of Interest

The authors declare that there is no conflict of interest.

## References

- [1] Attifi, H., Hmidi, M., Boukhari, A., Touihem, N., Kehani, M., Zalagh, M., *et al.* (2014) Expérienceoto-rhino-laryngologique de l'hôpital marocaine de campagne en Guinée Conakry. *The Pan African Medical Journal*, **19**, 40.  
<https://doi.org/10.11604/pamj.2014.19.40.4908>
- [2] Njifou, N.A., Ndjock, R., Essama, L., Moby, H., Motah, M., Fonyam, V., *et al.* (2013) Profil de la pathologie ORL à l'hôpital Laquinitinie de douala. *Médecine d'Afrique Noire*, **60**, 416-418.
- [3] Tall, H., Lamarti, I., Ndiaye, M. and Diallo, B.K. (2017) Pathologie otorhinolaryngologique (ORL) au Centre hospitalier régional de Louga (Sénégal). Profil épidémiologique et clinique. *Revue Internationale des Sciences Médicales, African Index Medicus*, **19**, 135-138.
- [4] Tania, S. and Olavo, M. (2010) Allergic Rhinitis in the Child and Associated Comorbidities. *Pediatric Allergy and Immunology*, **21**, 107-113.  
<https://doi.org/10.1111/j.1399-3038.2009.00933.x>
- [5] Anand, V.K. (2004) Epidemiology and Economic Impact of Rhinosinusitis. *The Annals of Otolaryngology Rhinology Laryngology*, **113**, 3-5.  
<https://doi.org/10.1177/00034894041130502>
- [6] Bhattacharyya, N. (2008) Relationship between Mucosal Inflammation, Computed Tomography, and Symptomatology in Chronic Rhinosinusitis without Polyposis. *Annals of Otolaryngology, Rhinology, and Laryngology*, **117**, 517-522.  
<https://doi.org/10.1177/000348940811700709>
- [7] Martin-Duverneuil, N., Sahli-Amor, M. and Chiras, J. (2008) Anatomie et imagerie du massif facial normal chez l'adulte. *Encycl Méd Chir (Elsevier Masson SAS, Paris)*. Radiodiagnostic-Squelette Normal-Neuroradiologie-Appareil locomoteur. 310-330.
- [8] Samaké, D., MaIga, Y.M., Sidibé, Y., Thiocary, S., Dara, Y., Touré, S.S., *et al.* (2013) Aspects épidémiologiques et cliniques des pathologies naso-sinusiennes en consultation dans une structure de santé de proximité de Bamako. *Médecine d'Afrique Noire*, **60**, 415-418.
- [9] Yekpe Ahouansou, H.P., Savi, D.E., Tove, K.M., Biaou, O., Adisso, L., Bonou, O., Tchaou, M., *et al.* (2015) Sinusites postérieures: Aspects épidémiologiques et tomodensitométriques à Cotonou. *Journal Africain d'Imagerie Médicale*, **7**, 217-222.
- [10] Adjibabi, W., Biaou, O., Bio-tchane, I., Alamou, S., Chakibou, A., Boko, J., *et al.* (2002) Rhinosinusite purulente en consultation. *ORL de ville Le Bénin médicale*, **22**, 35-38.
- [11] Stankiewicz, J.A. and Chow, J.M. (2002) A Diagnostic Dilemma for Chronic Rhino-

- sinusitis: Definition Accuracy and Validity. *American Journal of Rhinology*, **16**, 199-202. <https://doi.org/10.1177/194589240201600404>
- [12] Dubin, M.G., Kuhn, F.A. and Melroy, C.T. (2007) Radiographic Resolution of Chronic Rhinosinusitis without Polyposis after 6 Weeks vs 3 Weeks of Oral Antibiotics. *Annals of Allergy, Asthma & Immunology*, **98**, 32-35. [https://doi.org/10.1016/S1081-1206\(10\)60856-3](https://doi.org/10.1016/S1081-1206(10)60856-3)
- [13] Marple, B.F., Stankiewicz, J.A., Baroody, F.M., Chow, J.M., Conley, D.B., Corey, J.P., et al. (2009) Diagnosis and Management of Chronic Rhinosinusitis in Adults. *Postgraduate Medicine*, **121**, 121-136. <https://doi.org/10.3810/pgm.2009.11.2081>
- [14] Nanayakkara, J.P., Igwe, C., Roberts, D. and Hopkins, C. (2013) The Impact of Mental Health on Chronic Rhinosinusitis Symptom Scores. *European Archives of Oto-Rhino-Laryngology*, **270**, 1361-1364. <https://doi.org/10.1007/s00405-012-2230-1>
- [15] Fokkens, W.J., Lund, V.J., Mullol, J., Bachert, C., Alobid, I., Baroody, F., et al. (2012) EPOS 2012: European Position Paper on Rhinosinusitis and Nasal Polyps 2012. *Rhinology*, **50**, 1-12. <https://doi.org/10.4193/Rhino50E2>
- [16] Vogiatzi, T., Kloukos, D., Scarfe, W.C. and Bornstein, M.M. (2014) Incidence of Anatomical Variations and Disease of the Maxillary Sinuses as Identified by Cone Beam Computed Tomography: A Systematic Review. *The International Journal of Oral & Maxillofacial Implants*, **29**, 1301-1314. <https://doi.org/10.11607/jomi.3644>
- [17] Ouédraogo, B.P., Sereme, M., Gyebre, Y.M.C., Diallo, O., Ouattara, M. and Ouaba, K. (2011) Le polypeantrochoanal. A propos de deux cas cliniques. *Médecine d'Afrique Noire*, **5805**, 237-240.
- [18] Attifi, H., Hmidi, M., Touihem, N., Zalagh, M. and Messary, A. (2014) Les polypes antrochoanaux: Etude retrospective à propos de 11 cas. *Research fr*, **1**, 1071. <http://www.research-journal.net/fr>
- [19] Frosini, P., Picarella, G. and De Campora, E. (2009) Antrochoanal Polyp: Analysis of 200 Cases. *ACTA Otorhinolaryngologica Italica*, **29**, 21-26.
- [20] Adnane, C., Adouly, T., Rouadi, S., Abada, R., Roubal, M. and Janah, A. (2014) Polype antrochoanal de l'enfant: Epidémiologie et prise en charge. *Revue Marocaine de Santé publique*, **1**, 17-20.
- [21] Bozzo, C., Garrel, R., Meloni, F., et al. (2007) Endoscopic Treatment of Antrochoanal Polyps. *European Archives of Oto-Rhino-Laryngology*, **264**, 145-150. <https://doi.org/10.1007/s00405-006-0175-y>
- [22] Chomette, G. and Auriol, M. (1985) Classification des tumeurs bénignes et des kystes des maxillaires. *Revue de Stomatologie et de Chirurgie Maxillo-faciale*, **86**, 277-284.
- [23] Ayache, D. and Bonfils, P.J. (2009) O.R.L. 5e édition, Med-Line, Paris.
- [24] Moulin, G., Pascal, T., Jacquier, A., Vidal, V., Facon, F., Dessi, P. and Bartoli, J.M. (2003) Imagerie des sinusites chroniques de l'adulte. *Journal of Radiology*, **84**, 901-919.
- [25] Chagnon, S., Badachi, Y. and Lacombe, P. (2002) Ostéome. Encycl Méd Chir (Editions Scientifiques et Médicales Elsevier SAS, Paris, tous droits réservés), Radiodiagnostic-Neuroradiologie-Appareil locomoteur, 31-483-A-10.
- [26] Krimissa, K., Nadeif, N., Rafik, L., Mahtar, M., Kadiri, F., Aksim, M., et al. (2012) Les ostéomes sinusiens à extension orbitaire à propos de trois cas. *Journal Tunisiend'ORL*, **28**, 56-58.
- [27] Ahn, J.C., Lee, W.H., We, J., Rhee, C.S., Lee, C. and Kim, J.W. (2016) Nasal Septal

Deviation with Obstructive Symptoms: Association Found with Asthma But Not with Other General Health Problems. *American Journal of Rhinology & Allergy*, **30**, 17-20. <https://doi.org/10.2500/ajra.2016.30.4277>

- [28] Lehmann, P., Bouaziz, R., Page, C., Warin, M., Saliou, G., Deschepper, B., *et al.* (2009) Cavités sinusiennes de la face: Aspect scanographique des variantes anatomiques et leur risque chirurgical. *Journal of Radiology*, **90**, 21-30. [https://doi.org/10.1016/S0221-0363\(09\)70074-5](https://doi.org/10.1016/S0221-0363(09)70074-5)
- [29] Sazgar, A.A., Massah, J., Sadeghi, M., Bagheri, A. and Rasool, F. (2008) The Incidence of Concha Bullosa and the Correlation with Nasal Septal Deviation. *B-ENT*, **4**, 87-91.
- [30] Smith, K.D., Edwards, P.C., Saini, T.S. and Norton, N.S. (2010) The Prevalence of Concha Bullosa and Nasal Septal Deviation and Their Relationship to Maxillary Sinusitis by Volumetric Tomography. *International Journal of Dentistry*, **2010**, Article ID: 404982. <https://doi.org/10.1155/2010/404982>
- [31] Hatipoglu, H.G., Cetin, M.A. and Yuksel, E. (2008) Nasal Septal Deviation and Concha Bullosa Coexistence: CT Evaluation. *B-ENT*, **4**, 227-232.