

Olfaction disorders in patients suffering from chronic rhinosinusitis in Kinshasa, Democratic Republic of Congo: A cross-Sectional Study

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Abstract

Background: Approximately three-quarters of patients with chronic rhinosinusitis (CRS) develop an olfactory disorder (OD). Given the insidious nature and progressive onset of OD in CRS, many patients are not conscious making it difficult to recognize the prevalence of olfactory loss.

Objective: The present study aims to evaluate the frequency of TO, the characteristics of patients suffering from CRS in a hospital setting in Kinshasa.

Methods : This is a cross-sectional and analytical study conducted on 105 patients with CRS in 2 medical trainings of Kinshasa. Included patients should be ≤ 18 years, have a diagnosis of CRS, completed the primary level of study and given informed consent.

The ASOF questionnaire and the Sniffin sticks test (SST) were used for subjective and/or objective assessment of olfaction.

Results : The mean age of patients was 40.3 ± 1.4 years with a female predominance. Allergic comorbidities were the most reported antecedents. Nasal symptomatology was dominated by postnasal drip, pain and nasal obstruction. Subjectively, 22.9% of patients reported impaired olfaction. Using the SST, 63.8 %

of patients with CRS presented a TO dominated by hyposmia. The age of patients was significantly higher in patients with TO compared to the group without TO (42.6 ± 5.3 years vs 36.3 ± 13.3 ; $p : 0.035$).

Introduction

Rhinosinusitis (RS) is an inflammation of the sinonasal mucosa (Fokkens et al ., 2020) characterized by the symptoms such as nasal congestion or obstruction, headache, rhinorrhea often posterior, facial pain or feeling of fullness and smell disturbances (TO). RS can be acute (RSA) when symptoms last less than 12 weeks, and chronic (RSC) if symptoms persist permanently or intermittently for at least 12 weeks (Fokkens et al ., 2020 ; Peters et al ., 2021).

RS is among the leading causes of consultation in Otorhinolaryngology (ENT). Approximately 6 to 15% of the world population suffers from RSA per year, also, 5 to 12% of the world population suffers from CRS (Peters et al , 2021; Dietz de Loos et al , 2019). In its evolution, CRS impairs quality of life (QoL) and leads to health care expenses with economic consequences linked to absenteeism and reduced professional performance (Eloit et al., 2002).

Olfactory disorders are one of the cardinal points of CRS and would play an important role in the patient's QoL . Although olfactory disorders are frequent in CRS, several studies do not always systematically report the prevalence and degree of olfactory loss (Kholi et al., 2017)

Among patients with TO, CRS represents approximately 14 to 30% of the causes followed by neurological, traumatic, toxic, etc. causes (Dekeyser et al., 2024). The prevalence of olfactory dysfunction in patients with CRS is estimated at 78.2% in the USA (Kohli et al., 2017). In Europe, Rombaux et al. reported that 61 to 83% of patients with CRS have a smell disorder. However, most of these pa-

tients are unaware of this OT because of its insidious nature and chronic mode of installation (Rombaux et al., 2016).

In recent decades, the study of olfaction has attracted the interest of several researchers, especially with the advent of Coronavirus Disease 2019 (COVID-19) thus increasing ENT consultations for TO (Giacomelli et al., 2020 ; Kim et al., 2021). However, methods for assessing the loss and quality of olfaction are non-consensual and not widely used in clinics. (Hummel et al., 2022).

In DR Congo, Balungwe et al . using the Sniffin'sticks Test (SST) (adapted version) reported that rhinological causes were the most frequent in the population of South Kivu with olfactory disorders (Balungwe et al., 2020).

Given the paucity of data on olfaction in patients with CRS in our setting, the present study aims to evaluate olfaction as well as socio-demographic and clinical characteristics of patients with CRS.

Patients and methods

This cross-sectional study was carried out in the ENT departments of Saint Joseph Hospital and the University Clinics of Kinshasa, during the period from April to September 2024. The study population consisted of patients aged at least 18 years suffering from CRS diagnosed according to the EPOS 2020 criteria and having presented at least two of the symptoms of CRS such as nasal obstruction, anterior and/or posterior rhinorrhea, headaches or facial pressure or feeling of fullness, loss of smell (Fokkens , 2020).

A questionnaire on the socio-demographic and clinical characteristics of the patients was administered by two investigators, ENT interns, previously trained on the different procedures after pre-test. This questionnaire also included the subjective assessment of olfaction (ASOF questionnaire) and a protocol sheet of the Sniffin'Sticks Test olfactory test.

Disease severity was assessed using the visual analogue scale (VAS) (Lim M., et al) of major rhinologic symptoms (MRS), the modified Lund-Kennedy endoscopic score LKM (Zhang et al., 2017) and the Lund-Mackay (LM) scan score (Araújo Neto et al.).

Patients underwent a subjective assessment of olfaction using the Assessment Of Olfactory questionnaire. Function and olfaction-related quality of life (ASOF) (Pusswald et al ; Milap DR et al) comprising 12 items. These items have been grouped together into 3 categories : Subjective Olfactory Capability scale (SOC) , Smell-Related Problems (SRP) and Olfactory-Related Quality of life (ORQ).

Then, the Sniffin 'Sticks Tests (Extended test) ODOFIN burghart MESSTECHNIK (*mediSense* , LOT FA23002862), was used to measure the threshold (T), discrimination (D) and identification (I) of odors. The composite TDI score was rated out of 48, obtained by adding the scores of the 3 previous tests. Any patient with a TDI score less than or equal to 30.75 was considered to have an olfactory disorder. The olfactory disorder could be hyposmia (TDI between 16 – 30.75) or anosmia (TDI < 16).

Data were entered using Microsoft 365 Excel software and analyzed with SPSS version 27.0 software for statistical analysis. The information was present-

ed in the form of tables and figures.

Qualitative variables were summarized in the form of absolute and relative frequencies, while quantitative variables were summarized, depending on the normality of the distribution, in the form of medians (minimums and maximums) when the distribution was not normal or in the form of means (standard deviations) for normal distributions. For descriptive reasons, some quantitative variables were summarized according to measures of central tendency and dispersion (means and standard deviations, medians, minimum and maximum) without taking into account the distribution of the variable.

The Student 's T test was used to compare the means of the quantitative variables according to the qualitative dependent variable (olfactory disorder), and the Chi-square test to look for an association between the independent variables (qualitative) and the dependent variable (qualitative).

Results

Of 105 patients with RSC included, 67 (63.8%) had disturbed olfaction.

Patient characteristics

Sixty-seven women (63.8%) and 38 men (36.2%) had a mean age of 40.3 ± 1.4 years as shown in Table 1. The most representative age range was 36 to 55 years. Allergic comorbidities were the most representative. Few patients (21.9%) consumed tobacco, mainly the popular form, while almost half reported some alcohol consumption (Table 1).

Table I: Sociodemographic characteristics, history and comorbidities

Features	n	%
Age*	40.3 (±1.4)	
Sex		
Female	67	63.8
Male	38	36.2
Age group (years)		
18-35	41	39.1
36-55	44	41.9
56 and over	20	19.0
Level of education		
Non-University	57	54.3
University	48	45.7
Marital status		
In union	37	35.2
Lives alone	68	64.8
Financing of care		
Not insured	79	75.2
Insured	26	24.8
Occupation at risk of rhinosinusitis	13	12.4
History and comorbidities	n	%
Allergic diseases		
Atopy	28	26.7
Allergic rhinitis	19	18.1
Asthma	9	8.6
Drug allergy	9	8.6
Metabolic diseases		
High blood pressure	26	24.8
Known diabetes mellitus	2	1.9
Alcohol and smoking status		
Tobacco consumption	23	21.9
Form of tobacco consumed		
Socket	17	73.9
Cigarette	5	21.7
Mixed	1	4.3
Alcohol consumption	79	48.0

* Mean age (Standard deviation)

Patient clinic

Nasal symptoms were dominated by posterior nasal discharge, pain and nasal obstruction (Table 2). Table 3 informs us that nasal endoscopy was pathological in almost all patients. Nasal congestion and the presence of sero -mucous/mucous secretions were the most common. However, hypertrophy of the inferior turbinates, septal deviation and the presence of polyps were uncommon. About three out of four patients had an olfactory cleft accessible to examination.

Table II: Patient complaints

Complaints	N	%
<i>1. Rhinological</i>		
Post nasal discharge	98	93.3
Pain	97	92.4
Nasal obstruction	94	89.5
Loss of smell	82	78.1
Anterior nasal discharge	74	70.5
Cacosmia	42	40
Sneeze	13	12.4
Nasal hyperreactivity	10	9.52
Epistaxis	4	3.81
Hemmage and closed rhinolalia	2	1.9
<i>2. Other</i>		
<i>complaints**</i>	87	77.1
Dizziness	48	62
Pharyngeal paresthesias	6	7.8
Otorrhea	4	5.2
Tinnitus	3	3.9
Dysphonia	3	3.9
Earaches	3	3.9
Blurred visions	3	3.9
Ear itching	2	2.6
Eye itching	2	2.6
Sensation of blocked ears	2	2.6
Odynophagia	1	1.3

Table III: Elements observed during nasal endoscopy

Features	FNG* n(%)	FND** n(%)
Pathological nasal endoscopy	103 (98.1)	105 (100)
Condition of the nasal mucosa		
Congestive	66 (62.9)	67 (63.8)
Pale	25 (23.8)	26 (24.8)
Secretion in the nose		
Serous/ seromucous secretions	41 (39)	44 (41.9)
Mucous membranes	18 (17.1)	12 (11.4)
Mucopurulent	27 (25.7)	33 (31.4)
Condition of the lower cornea		
Hypertrophic	21 (20)	15 (14.3)
Nasal septum condition		
Diverted	10 (9.5)	2 (1.9)
Polyp	9 (8.6)	7 (6.7)
Accessibility of the olfactory cleft	73 (69.5)	74 (70.5)

FNG*: false left nasal FND**: false right nasal

The mean VAS of SRM was 5.6±0.26 for headache; 5.2±0.26 for posterior nasal discharge; 5.0±0.27 for nasal obstruction; 4.2±0.32 for loss of smell and 3.8±0.32 for anterior nasal discharge, respectively (Figure 1). The mean LKM and LM scores were 3.9±0.2 and 5.4±0.3, respectively, as reported in Table 7. **Figure 1** : EVA des symptômes rhinologiques majeurs

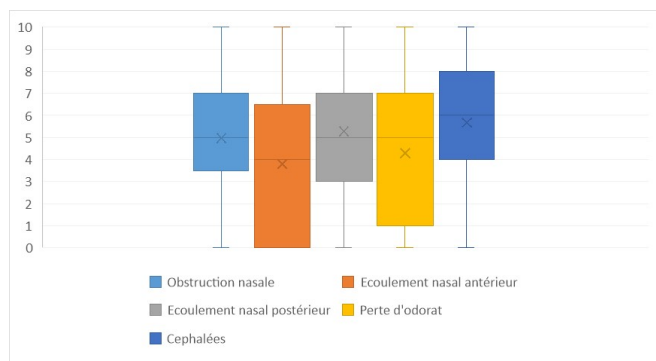


Figure 1 : EVA of major rhinological symptoms

The mean score obtained during the subjective assessment using the ASOF questionnaire was 6.1 (±1.4), 3.0 (±1.4) and 3.6 (±1.3) respectively for SOC, SRP and ORQ table 3. This mean score was significantly different (< 0.001) between those who had an olfactory disorder and those who did not (Table 4).

Table IV: Mean ASOF and Sniffin sticks test scores

	SOC	SRP	ORQ	T	D	I	TDI
Average (ET)	6.1 (±3.1)	3.0 (±1.4)	3.6 (±1.3)	9.1 (±0.5)	8.7 (±0.4)	6.8 (±0.3)	25.5 (±1.1)
Median	6	3	4	9.5	10	8	27.5
Minimum	0	1	1	0	0	0	0
Maximum	10	5	5	16	15	12	40

SOC: subjective olfactory capability scale

SRP: smell-related problems

ORQ: olfactory-related quality of life.

T: Threshold

D: Discrimination

I: Identification

TDI: TDI composite score

Subjectively, two out of ten patients reported impaired olfaction. About half of the patients reported difficulty perceiving specific odors and had impaired quality of life related to olfaction. By objective assessment, two-thirds of patients had experienced TO. Among patients with TO, hyposmia and anosmia accounted for 73.1% and 26.9%, respectively (Table 5).

Taking into account age, patients older than 55 years had lower T, D and I values, as well as TDI score compared to younger patients as shown in Table 5.

Table V: Evaluation of olfactory function and quality of life

Settings	n	%
1. Subjective evaluation		
SOC		
Unaltered olfaction	81	77.1
Altered olfaction	24	22.9
SRP		
No difficulty in perceiving odors	55	52.4
Difficulty perceiving odors	50	47.6
ORQ		
No alteration of quality of life linked to smell	57	54.3
Impairment of quality of life related to smell	48	45.7
2. Objective assessment of smell (TDI*)		
Normal sense of smell	38	36.2
Disturbed sense of smell	67	63.8
Anosmia	18	26.9
Hyposmia	49	73.1

Abbreviations: SOC: subjective olfactory capability

scale

SRP: smell-related problems

ORQ: olfactory-related quality of life.

TDI*: Threshold composite score , discrimination, identification

Comparing the socio-demographic, clinical characteristics and severity of CRS of the patients, the age was significantly higher in the group of patients with olfactory disorder compared to the group without OT (42.6 ± 5.3 years vs. 36.3 ± 13.3 ; $p:0.035$). The other characteristics were not different between the two groups (non-significant p, Table 6).

Table VI: Comparison of ASOF score means according to olfactory disorder

	Total	Olfactory disorder		p
		Here	Absent	
Subjective Olfactory Capability scale (SOC)	5,9 ($\pm 0,3$)	5,3 ($\pm 3,3$)	7,5 ($\pm 2,4$)	<0,001
Smell-Related Problems (SRP)	3,0 ($\pm 0,1$)	2,7 ($\pm 1,4$)	3,7 ($\pm 1,9$)	<0,001
Olfactory-Related Quality of life (ORQ)	3,6 ($\pm 0,1$)	3,2 ($\pm 1,3$)	4,3 ($\pm 1,0$)	<0,001

ASOF : Assessment Of Olfactory Function and olfaction-related quality of life

Table VII: Olfactory tests according to age

	18-35 ans				36-55 ans				56 ans et plus			
	T	D	I	TDI	T	D	I	TDI	T	D	I	TDI
Mean (SD)	10.01 (± 4.98)	10.27 (± 3.25)	7.78 (± 2.85)	27.93 (± 9.16)	9.80 (± 5.48)	8.52 (± 3.89)	6.55 (± 3.01)	24.8 (± 10.6)	5.67 (± 6.07)	5.85 (± 4.47)	5.4 (± 3.87)	16.93 (± 12.78)
Median	10.5	11	8	29.5	10,375	10	7	27,5	4,75	7,5	7	17,5
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	16	14	12	40	16	15	11	37	16	14	10	35

Table VIII: Comparison of patient characteristics between those with and without olfactory disturbances

	Total	Olfactory disorder		p
		Here	Absent	
Age	40.3 (± 1.4)	42.6 (± 15.3)	36.3 (± 13.1)	0.035
Sex				0.529
Female	67 (63.8)	41 (61.2)	26 (68.4)	
Male	38 (36.2)	26 (38.8)	12 (31.6)	
Occupation at risk of SR	13 (12.3)	7 (10.4)	6 (15.8)	0.539
Allergic rhinitis	19 (18.1)	10 (14.9)	9 (23.7)	0.298
High blood pressure	26 (24.8)	18 (26.9)	8 (21.1)	0.639
Diabetes mellitus	2 (1.9)	0 (0.0)	2 (5.3)	0.129
Allergic rhinitis	86 (81.9)	57 (85.1)	29 (76.3)	0.298
Asthma	9 (8.6)	6 (9.0)	3 (7.9)	1
Tobacco consumption	23 (21.9)	12 (17.9)	11 (28.9)	0.223

Alcohol consumption	48 (45.7)	32 (47.8)	16 (42.1)	0.684
Congestion	65 (61.9)	41 (61.2)	24 (63.2)	1
Polyp	10 (9.5)	6 (9.0)	4 (10.5)	1
Hypertrophy of the inferior turbinates	23 (21.9)	15 (22,4)	8 (21,1)	1
Déviation septale	12 (11,4)	9 (13,4)	3 (7,9)	0,53
Score de Lund-Kennedy	3,9 (±0,2)	4,1 (±2,0)	3,6 (±1,6)	0,207
Score de Lund-Mackay	5,4 (±0,3)	5,3 (±3,3)	7,5 (±2,4)	0,067

Discussion

Strength and limitations of the study

This study is the first on TOs that can occur in patients with CRS in our setting. However, its hospital and cross-sectional nature as well as the sample size, not being exhaustive, do not allow us to generalize our results to the general population.

Approximately two-thirds of patients with CRS (63.8%) had TO in the present study. This result is similar to that found by Yuan (62.86%) in a study conducted in China. However, our frequency is slightly higher than that found by Soler et al. (58.2%) and lower than those of Kholi et al. and Schlosser et al. who found 78.2% and 73% respectively while using the same SST.

This high frequency is not unexpected because the literature reports that 61 to 83% of patients with RSC would suffer from olfactory disorders (Rombaux et al., 2016). Nevertheless, the difference observed between our series and those of others can be explained by the fact that the means of assessing olfactory dysfunction are not consensual to date. Indeed, the SST used assesses olfaction by taking into account the composite TDI score which is the sum obtained for the threshold, discrimination and identification tests. The SST is not a standardized test and would be influenced by the local culture (usual odors) of the population studied, thus justifying this difference between people. However, the threshold and discrimination tests are not influenced by the culture or the type of odors apart from

the variation of the identification test which can have an impact on the overall TDI score obtained. And therefore, on the classification: normal olfaction and abnormal or pathological olfaction (Balungwe, 2020).

The mean age of patients in our study was 40.3 ± 1.4 years. It is lower than that found in the studies of Fan Yuan et al., Loftus et al. and Soler et al. who found 43.6 ± 12.9 years, 50 ± 16.1 years and 52.7 ± 16.1 years in studies conducted in China and the USA respectively. These results can be explained by the difference in study populations. Indeed, the African population is young compared to the Western population where the other studies were conducted. The female sex was predominant (63.8%). On the other hand, the work of Yuan et al. reported a male predominance (65.7%). Loftus et al. and Zhang et al. reported an equal distribution between the two sexes. This disparity in the different results reported could be due to the fact that women are more concerned with appearance, more sensitive to illness, beauty and/or odors compared to men. However, there was no difference in the mean scores obtained during the olfactory tests between female and male patients.

Subjectively, only 22% of patients claimed to have impaired olfaction according to the ASOF-SOC score and almost half of the patients (47.6%) reported difficulties in the perception of specific odors (ASOF-SRP). When objectively assessing olfaction using SST, approximately two-thirds of patients

(63.8%) had impaired olfaction. These results are consistent with the findings of Mattos et al. that there is a difference between subjectively reported TO and the results of psychophysical tests obtained by patients. Indeed, the literature reports that approximately one in four patients with CRS are unaware of it (Rombaux et al., 2016). This demonstrates the limitations of self-assessment tests, which are not sufficiently reliable tools for the diagnosis of olfactory disorders when used alone. These findings regarding the lack of awareness of TOs existing in patients suffering from CRS highlight the importance of the need to integrate objective tests into the evaluation of olfaction, which remains to this day an underestimated and clinically undervalued sense in our environment, while it turns out to be essential for having a good quality of life and for being able to protect ourselves from dangerous situations that could affect our safety.

Hyposmia was the most commonly found olfactory disorder. Schlosser et al. reported similar results. However, TO was independent of the gender of the patients in this study, whether for the Threshold, Discrimination or Identification test. Although some authors have reported that female gender would be more affected by TO (Balungwe et al., 2020). In the mechanism of installation of olfactory disorders, gender would not play an important role (Rombaux et al., 2016). On the other hand, the age of the patients was significantly associated with TO in the present study. Patients aged over 55 years were the most affected by TO. This result is consistent with the observations of Rombaux (Rombaux et al., 2016), Dalton (Dalton et al., 2004), Balungwe (Balungwe et al., 2020) and many other authors. Thus, senescence also involving olfactory sensory cells would be associated with olfactory disorders in elderly subjects (Attems et al., 2015)

It also emerges from this study that the means obtained during the assessment of olfaction using the ASOF questionnaire were different with regard to SOC, SRP and ORC comparing those who had an olfactory disorder and those who did not. This result is similar to the conclusions of Pusswald et al. according to which the ASOF questionnaire could be used as a subjective assessment tool of olfactory function (Pusswald et al, 2012). However, it should be noted that this questionnaire remains a subjective assessment and very dependent on the patient who should always be supplemented by an objective test of olfaction.

In conclusion, TOs are common in CRS and affect on average two out of three patients and depending on age. Olfactory assessment is necessary in patients affected by sinonasal pathologies . Thus, a large-scale study will be considered to evaluate the prevalence of TOs in the general population.

Authors' contribution

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Original version: Tshingamb Kamin Yasmin, Mpiana Sympho and Nyembue Tshipukane Dieudonné;

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