# SYMPTOMATIC TREATMENT OF DYSOSMIA IN RHINOLOGICAL PATHOLOGY OF FUNCTIONAL AND VIRAL (SARS-CoV-2) ORIGIN

*Shushliapina N.O., Kalashnyk-Vakulenko Y.M., Bondarenko Y.D.*

**Kharkiv National Medical University, Kharkiv, Ukraine**

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**ABSTRACT**

**Background.** Olfactory disorders are widespread and are of considerable socio-medical importance. However, effective evidence-based approaches to the symptomatic treatment of dysosmia – both in common rhinological diseases and post-viral conditions, particularly COVID-19-associated olfactory dysfunction – remain insufficiently defined.

**Aim.** To evaluate the effectiveness of symptomatic conservative therapy in the treatment of patients with respiratory dysosmia of functional and viral (SARS-CoV-2) origin, including assessment of olfactory function.

**Materials & Methods.** The study included 183 patients, aged 18 to 60, with olfactory dysfunction resulting from rhinological pathology of functional and post-viral origin. The patients were divided into four groups and received traditional symptomatic treatment. Data collection involved the SNOT-22 questionnaire, rhinomanometry, and olfactometry, conducted both before and after treatment. Statistical analysis was performed using descriptive statistics and Student's t-test with Excel 2022 (Microsoft, USA).

**Research Ethics.** The study was conducted in accordance with the ethical standards of the World Medical Association Declaration of Helsinki (1964–2024). All study participants provided informed consent.

**Results.** The symptomatic treatment demonstrated significant effectiveness across the groups according to the questionnaire results ($p<0.001$), showing a reduction in subjective symptoms. Rhinomanometry findings also showed significant improvement in indicators across all groups ($p<0.05$); however, a moderate degree of severity persisted in patients with functional dysosmia. Following treatment, olfactometry findings demonstrated no significant improvement in olfaction among patients with viral dysosmia ($p=0.33$). In the remaining groups, the degree of olfactory impairment remained at the level of hyposmia, although the indicators were higher post-treatment ($p<0.005$).

**Conclusions.** The choice of treatment method for patients with olfactory dysfunction should be considered based on the disease origin, with particular focus on the mechanical-obstructive and sensorineural mechanisms of its development.

***Keywords:*** *otolaryngology, olfactory dysfunction, rhinomanometry, COVID-19, rhinosinusitis, nasal obstruction.*

## Introduction

Dysosmia, including anosmia, hyposmia, parosmia, and other olfactory disorders, represent a heterogeneous group of clinical conditions with multifactorial etiology and a complex pathophysiological architecture, posing a substantial challenge in modern rhinological practice and significantly determining patients' quality of life [1; 2]. Despite the high prevalence and socio-medical significance of olfactory disorders, current clinical practice is characterized by a limited evidence base regarding effective therapeutic strategies for the symptomatic treatment of dysosmias – both in classic rhinological diseases and in post-viral conditions, including COVID-19-associated dysfunction (COronaVIrus Disease-2019) [3; 4]. In the context of modern pharmacotherapy in otorhinolaryngology, local and systemic corticosteroids traditionally constitute the cornerstone of anti-inflammatory therapy for acute and chronic rhinosinusitis, allergic rhinitis, and associated inflammatory diseases of the middle ear [5]. At the same time, clinical observations indicate their inconsis-

Corresponding Author:
*Shushliapina Nataliia O.* – Candidate of Medical Sciences, Associate Professor of the Department of Otorhinolaryngology of the Kharkiv National Medical University, Ukraine.
✉ 4, Nauky Ave., Kharkiv, 61022, Ukraine.
E-mail: no.shushliapina@knmu.edu.ua

tent and often unsatisfactory effectiveness in cases of virus-induced olfactory dysfunction, necessitating a critical reappraisal of the pathophysiological rationale for their use [6]. Thus, post-viral perceptual (sensorineural) dysosmia arises as a result of damage to the olfactory epithelium or central olfactory pathways in the absence of significant nasal obstruction [7]. In contrast to conductive forms, perceptual dysosmia does not respond to surgical or anti-inflammatory treatment [8; 9].

Alongside inflammatory processes, anatomical and functional abnormalities of the nasal cavity play a significant role in the development of olfactory dysfunction, as they determine pathological airflow aerodynamics and impaired transport of odorants to the olfactory region, which likewise require an appropriate therapeutic strategy. Architectural impairments, such as nasal septal deviation, concha bullosa (pneumatization of the middle turbinate), paradoxical curvature of the middle turbinate, hypertrophy of the inferior turbinates, and other structural anomalies of the nasal architecture, create mechanical obstructions to normal airflow reaching the olfactory cleft in the superior nasal meatus and the olfactory zone at the level of the superior turbinate [10; 11]. These variations in anatomical structure lead to airflow turbulence, a reduction in its laminar component within the upper regions of the nasal cavity, and a decrease in the effective delivery of odorant molecules to the olfactory epithelium [12]. In such cases, surgical correction of anatomical deformities may become the only viable option to restore aerodynamics and improve olfaction in patients with conductive impairments [13]. Specifically, techniques such as septoplasty, conchoplasty, reduction of hypertrophied inferior turbinates, polypectomy, and endoscopic treatment of chronic rhinosinusitis are used [14]. Therefore, our objective is to analyze two pathogenetically independent cascades of olfactory dysfunction with fundamentally different structural and functional substrates, clinical presentations, and therapeutic responses.

The **aim** of the study was to evaluate the effectiveness of symptomatic conservative therapy in the treatment of patients with respiratory dysosmia of functional and viral (SARS-CoV-2) origin, including assessment of olfactory function.

**Material and Methods**

The study included 183 patients (115 men and 68 women) aged 18 to 60 years who were hospitalized in the Head and Neck Surgery Department of the Municipal Nonprofit Enterprise of Kharkiv Regional Council "Regional Clinical Hospital",

The participants were divided into four groups based on the disease origin. Group1consisted of 38 patients with acute post-viral rhinosinusitis caused by COVID-19, with duration of up to 12 weeks. COVID-19 diagnosis was confirmed based on a documented positive polymerase chain reaction test findings. Group 2 included 53 patients with impaired nasal breathing and structural changes in the nasal cavity architecture lasting for 3–5 years. Group 3 comprised 48 patients with impaired nasal breathing and structural changes in the intranasal structures with duration of up to 6 months. Group 4 consisted of 44 patients with impaired nasal breathing and structural changes in the nasal architecture lasting up to 1 month.

All patients received traditional therapy, which included topical decongestants (xylometolazine 0.1% 2 drops in each nostril three times daily) and irrigation therapy (isotonic saline solution, 1 spray in each nostril three times daily) for 10 days.

The patients with acute rhinosinusitis; history of COVID-19 within the previous 12 weeks; presence of impaired nasal breathing and olfactory dysfunction associated with pathology of the intranasal structures; patient age between 18 and 60 years; signed informed consent were included. Exclusion criteria were age under 18 or over 60 years; chronic rhinosinusitis (with or without nasal polyps); olfactory dysfunction of traumatic origin; pregnancy; and oncologic diseases.

Clinical examination included the symptom assessment using the validated Ukrainian version of the SNOT-22 questionnaire (Sino-Nasal Outcome Test-22) [15; 16] consisting of 22 items designed to assess the severity of nasal symptoms. Each symptom was rated on a scale from 0 (absence of symptoms) to 5 (very severe). The total score ranged from 0 to 110, with higher values indicating a greater negative impact of symptoms on quality of life. An ENT examination included nasal endoscopy. Nasal breathing was evaluated by measuring aerodynamic nasal resistance using posterior active rhinomanometry with a computerized rhinomanometer. Olfactory function was assessed using the Sniffin' Sticks test (Burghart®, Germany) and a method for processing respiratory test signals in response to various types of odorants [17; 18]. The results of olfactometry were evaluated in accordance with the provided data of the test system as anosmia (1 point), hyposmia (2–6 points) and normosmia (7–16 points) according to the threshold test. The identification test data, depending on the number of correctly identified markers with an odorant, had a value of 0–6 points

for anosmia, 7–10 points for hyposmia, 11–12 points – normosmia.

To determine treatment effectiveness in the examined patients, subjective and objective parameters were recorded before and after therapy. The effectiveness of the prescribed symptomatic conservative treatment was evaluated based on the changes in subjective rhinological symptoms including reduction of nasal obstruction, restoration of nasal breathing, decreased nasal secretion, and improvement of olfactory function, as well as objective measures – rhinomanometry and olfactometry results.

Statistical analysis of the obtained results was performed using biometric methods within Microsoft Excel 2022 (Microsoft, USA). In the descriptive analysis, continuous variables were presented as [mean ± standard deviation], while categorical variables were expressed as frequencies and percentages. The Shapiro Wilk test was used to assess the distribution of variables. To compare indicators before and after treatment within each group, the paired Student's t-test was utilized. The results were considered statistically significant at $p<0.05$.

**Research Ethics**

The study was conducted in accordance with the ethical principles of the World Medical Association Declaration of Helsinki (1964–2024), Directive 86/609 of the European Community on the participation of humans in biomedical research, and Order No.690 of the Ministry of Health of Ukraine dated September 23, 2009. Written informed consent for participation in the study was obtained from all participants after they were provided with clear, comprehensive, and accessible information regarding the study purpose, design, and methodology, as well as its potential risks, expected benefits, possible alternatives, and the voluntary nature of participation.

**Results**

During the initial examination, the most common complaints in the subjective status of all evaluated patients included impaired nasal breathing and nasal congestion. In Group 1, according to the questionnaire results, the mean score was [61.4± ±2.2]. The most prevalent complaints included nasal congestion (63.1%), post-nasal drip (34.2%), rhinorrhea (21.1%) and facial pain/pressure (13.2%). In most cases, the severity of these symptoms ranged from 1 to 3 points, corresponding to a moderate impact on quality of life. All patients reported olfactory impairment, of which 31.6% rated it at 5 points, 52.6% at 4 points, and 15.8 % at 3 points, indicating a significant impact on quality of life.

According to the questionnaire results, the mean SNOT-22 score for patients in Group 2 was [74.8±2.4]. The most prevalent complaints were nasal congestion (100.0%), nasal discharge (64.1%), post-nasal drip (26.4%), and facial pain/pressure (15.1%), with the severity of these symptoms ranging from 3 to 5 points. Olfactory impairment was reported by all patients, with severity scores varying between 3 and 4 points, corresponding to a moderate impact on quality of life.

In Group 3, the mean SNOT-22 score was [68.6±1.9] points. All patients reported nasal congestion, while 52.1% of individuals experienced nasal discharge, 33.3% had post-nasal drip, and 10.4% reported facial pain/pressure. The severity of these symptoms ranged from 2 to 4 points, indicating a moderate impact on quality of life. The majority of patients rated their olfactory impairment at 2 points (62.5 %), while 37.5 % rated it at 3 points.

In Group 4, the mean score according to the questionnaire was [81.3±2.7]. The most prevalent complaints included nasal congestion (100.0%), nasal discharge (72.7%), post-nasal drip (31.8%), and facial pain/pressure (18.2%), with the severity of these symptoms ranging from 3 to 5 points. Olfactory impairment was observed in all patients, with severity scores varying from 3 to 5 points.

Endoscopic examination of the nasal cavity revealed hyperemia and edema of the nasal mucosa, along with minor mucous discharge. Obstruction of the olfactory cleft was observed in 2 patients (5.3%) in Group 1 (partial obstruction), 19 patients (35.8%) in Group 2, 13 patients (27.0%) in Group 3, and 15 patients (34.1%) in Group 4. In cases where endoscopic visualization of the olfactory cleft was not possible, computed tomography was performed.

Rhinomanometry results revealed an increase in aerodynamic nasal resistance across all patients. In Group 1, the mean aerodynamic resistance coefficient was [1.9±0.4] kPa·s/L. In Group 2, the aerodynamic resistance was in the range of [3.1± ±0.4] kPa·s/L. In Group 3, the value was [2.2±0.4] kPa·s/L, while in the fourth Group, the aerodynamic resistance was in the range of [3.6±0.5] kPa·s/L.

According to the olfactometric assessment in Group 1 following COVID-19, anosmia was identified in 12 patients (31.6 %) based on both the threshold test (mean score [0.9±0.5]) and the identification test (mean score [5.0±1.2]). Hyposmia

was observed in 26 patients (68.4 %), with mean threshold test scores of [4.1±0.9] points and identification test scores of [8.2±1.3] points.

All patients in Group 2 demonstrated hyposmia at a level of [4.1±1.3] points according to olfactometric threshold testing. The identification test revealed hyposmia in 48.3 % of patients, with a mean score of [10.3±1.3] points, while normosmia was observed in 51.7% of patients with a mean score of [11.8±1.7] points.

Olfactometric examination of patients in Group 3 revealed a mild degree of olfactory impairment on the threshold test in all patients, with a mean score of [5.6±2.2]. On the identification test, the majority of patients (81.3%) demonstrated normosmia, while hyposmia was observed in 18.7% of individuals, with a mean score of [10.2±1.2] points.

Olfactometry results for Group 4 revealed hyposmia according to the threshold test, with a mean score of [3.4±2.4] points. The identification test showed moderate hyposmia in 62.7 % of patients, with a score of [9.3±1.4] points, while normosmia was observed in 37.2 % of individuals.

The treatment effectiveness in the study groups was evaluated based on follow-up instrumental examinations and the assessment of subjective symptoms using the SNOT-22 questionnaire (*Table*).

in all patients and were rated at 5 points in 31.6%, at 4 points in 50.0%, and at 3 points in 18.4%. These findings were confirmed by objective assessments. Specifically, rhinomanometry demonstrated a statistically significant reduction in the nasal resistance coefficient, which decreased to [0.8±0.6] kPa·s/L. In contrast, no statistically significant difference was observed between pre- and post-treatment olfactometric results (p=0.33), and a severe degree of olfactory loss persisted in the form of anosmia and hyposmia.

Patients in Group 2 also demonstrated a positive therapeutic effect. According to the questionnaire findings, the majority of patients reported improvement in nasal breathing (69.8%) and a reduction in nasal discharge (88.6%). Overall, symptom severity was rated at 3 points. Complaints of olfactory impairment persisted in all patients; however, 43.3 % reported some degree of improvement. The mean SNOT-22 score was [45.4±1.8] points. Rhinomanometric findings indicated a statistically significant reduction in the nasal resistance coefficient to [2.1±0.6] kPa·s/L, although it remained moderately elevated. Olfactometric assessment demonstrated a significant improvement in olfactory function, particularly on the identification test, which reached normal values ([11.1±2.4] points). Nevertheless, hyposmia

*Table. Comparison of examination results before and after treatment in the studied groups*

| Parameter | Group 1 | | Group 2 | | Group 3 | | Group 4 | |
|---|---|---|---|---|---|---|---|---|
| | Before | After | Before | After | Before | After | Before | After |
| SNOT-22 | 61.4±2.2 | 34.5±2.3 | 74.8±2.4 | 45.4±1.8 | 68.6±1.9 | 37.3±1.5 | 81,3±2.7 | 49.6±1.7 |
| | p<0.001 | | p<0.001 | | p<0.001 | | p<0.001 | |
| Rhinomanometry | 1.9±0.4 | 0.8± 0.6 | 3.1±0.4 | 2.1±0.6 | 2.2±0.4 | 1.9±0.4 | 3.6±0.5 | 2.4±0.7 |
| | p<0.05 | | p<0.05 | | p<0.05 | | p<0.05 | |
| Olfactometry | 0.9±0.5* 5.0±1.2** | 1.0±0.8* 5.5±1.4** | 4.1±1.3* 10.3±1.3** | 5.3±1.6* 11.1±2.4** | 5.6± 2.2* 10.2±1.2** | 6.4±2.1* 11.0±2.2** | 3.4± 2.4* 9.3±1.4** | 4.7± 0.9* 10.7±1.7** |
| | p=0.33 | | p=0.001 | | p<0.005 | | p<0.001 | |

*Notes: * – threshold test; ** – identification test.*

After the course of symptomatic therapy the patients in Group 1 demonstrated a positive dynamics according to questionnaire results, with a mean score of [34.5±2.3] points. The patients reported a reduction in both the number and severity of symptoms. Nasal obstruction persisted in 7 individuals (18.4%) and was rated at 2 points. However, complaints of olfactory impairment persisted

persisted on the threshold test in the majority of patients ([5.3±1.6] points).

In patients of group 3, SNOT-22 scores improved significantly, primarily due to a reduction in nasal obstruction and nasal discharge. Overall, symptoms were rated by patients at 2 (43.7%) or 3 points (56.3%). Olfactory function was assessed at 2 points in 71.7% of patients and at 3 points in

28.3%. The mean SNOT-22 score was [37.3±1.5] points.

Rhinomanometric evaluation demonstrated a statistically significant decrease in the nasal resistance coefficient to [1.9±0.4] kPa·s/L, although it remained moderately elevated. Olfactometric testing also showed a significant improvement in both the threshold test ([6.4±2.1] points) and the identification test ([11.0±2.2] points), indicating a mild degree of dysosmia.

Treatment effectiveness was also observed in patients of Group 4. Questionnaire findings indicated a reduction in the severity of subjective complaints, particularly nasal obstruction (70.5%) and nasal discharge (79.5%), which was generally rated at 4 points. Complaints of olfactory impairment persisted; however, the severity of their impact decreased and was rated at 3 to 4 points. The mean SNOT-22 score was [49.6±1.7] points. Rhinomanometric assessment showed that the nasal resistance coefficient remained moderately elevated at [2.4±0.7] kPa·s/L, but a statistically significant improvement after treatment was observed ($p<0.05$). Olfactometric evaluation demonstrated a significant improvement in olfactory parameters; however, values remained reduced on both the threshold test ([4.7±0.9] points) and the identification test ([10.7±1.7] points).

**Discussion**

The administered symptomatic treatment aimed at reducing mucosal edema demonstrated effectiveness across all study groups. This is confirmed by a reduction in subjective symptoms by more than 1.6 times and 1.5 times decrease in nasal resistance within the examined groups. It should be noted that, despite the significant improvement, patients in groups 2, 3, and 4 maintained a relatively high nasal resistance coefficient, which is attributed to impaired nasal cavity architectonics. In the majority of patients, olfactory impairment was more pronounced in the threshold test than in the identification test, which may further indicate the presence of mechanical obstructions preventing odorant vectors from binding to olfactory receptors. However, patients in group 1 continued to exhibit significant olfactory loss in the form of anosmia and hyposmia, suggesting a perceptual (sensorineural) mechanism of olfactory dysfunction caused by COVID-19.

The study demonstrated that the development of olfactory dysfunction depends on the etiology of the disease. Furthermore, the research proves that dysosmias of various etiologies should not be considered a single pathophysiological phenomenon, but rather the result of two fundamentally different mechanisms: conductive (mechanical-obstructive) and sensorineural (neuroepithelial-destructive), each of which requires a specific strategy in the choice of treatment. In the conductive type of dysosmia, the olfactory epithelium remains morphologically intact and functionally preserved; the pathology lies in the creation of a barrier preventing odorant access to the receptor zone due to edema, hypersecretion, or anatomical abnormalities. In such cases, anti-inflammatory therapy aimed at resolving the obstruction is pathogenetically justified and highly effective; however, structural changes in the architectonics of intranasal structures necessitate the use of methods alternative to therapeutic intervention. In this regard, surgical planning utilizing computerized virtual analysis of aerodynamic changes in the nasal cavity and paranasal sinuses would be the most appropriate approach [19]. In contrast, in the sensorineural type characteristic of virus-induced dysosmias, the primary lesion is localized directly within the olfactory apparatus at the level of cellular destruction of sustentacular cells and impairment of the regenerative potential of basal cells. This renders anti-inflammatory therapy pathophysiologically insufficient, as irrigation and corticosteroids lack regenerative properties and are unable to restore the damaged epithelium [20]. In such cases, a fundamentally different strategy, namely neurorehabilitation through olfactory training aimed at stimulating epithelial regeneration and central neuroplasticity, is required. Accordingly, the mismatch between the underlying pathophysiological mechanism and the therapeutic approach explains the high rate of treatment failure observed with conventional anti-inflammatory therapies in post-viral dysosmias and underscores the necessity of mandatory clinical phenotyping of dysosmias prior to therapy selection.

**Conclusions**

1. The choice of treatment method for patients with olfactory dysfunction should be considered based on the disease origin, with particular focus on the mechanical-obstructive and sensorineural mechanisms of its development.

2. Conservative therapy contributed to a more rapid regression of both subjective and objective manifestations of the inflammatory response, which was accompanied by a reduction in mucosal edema and improvement in aerodynamic parameters across all studied clinical groups. Therefore, the outcomes of conservative symptomatic treatment may be regarded as highly favorable. Ho-

wever, in patients of clinical groups 2, 3, and 4, elevated olfactory perception thresholds persisted despite subjective and objective reduction of edema. This likely indicates the need for additional therapeutic approaches, including surgical correction of intranasal structures.

3. In patients of group 1, a mixed type of olfactory dysfunction was observed; therefore, complete recovery of olfactory function after resolution of mucosal edema cannot be expected. Consequently, further management in these patients should include therapeutic approaches aimed at restoring receptor mechanisms of olfaction, in particular neurorehabilitation through olfactory training.

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**Authors' Contributions**

| Contribution / Authors | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Shushliapina N.O. | + | + | + | | + | + |
| Kalashnyk-Vakulenko Y.M. | + | + | + | | + | + |
| Bondarenko Y.D. | | | | + | + | + |

Notes: A – concept; B – design; C – data collection;
D – statistical processing and interpretation of data;
E – writing or critical editing of the article;
F – approval of the final version for publication and agreement to be responsible for all aspects of the work.

**Declarations**

Conflict of interest is absent.

All authors have given their consent to the publication of the article, to the processing and publication of their personal data.

The authors of the manuscript state that in the process of conducting research, preparing, and editing this manuscript, they did not use any generative AI tools or services to perform any of the tasks listed in the Generative AI Delegation Taxonomy (GAIDeT, 2025). All stages of work (from the development of the research concept to the final editing) were carried out without the involvement of generative artificial intelligence, exclusively by the authors.

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