

How relevant is the impairment of smell for the quality of life in allergic rhinitis?

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Purpose of review

In the present review, the authors try to evaluate how relevant smell impairment is in patients suffering from allergic rhinitis and how it affects their quality of life. Smell dysfunction has a significant impact on the quality of life as it can lead to a wrong choice of food and intake, a reduction in appetite and eventually to weight loss, malnutrition, immunity reduction and worsening of medical illness. Patients with smell impairment are reported to use larger quantities of sugar and salt to highlight flavours, thus worsening their general health condition and increasing the risk of developing diabetes and hypertension.

Recent findings

Recent studies estimate that a complete loss of the sense of smell can be found in at least 1% of the US population, and that an impairment in the olfactory function can be highlighted in about 24% of individuals aged 53–97 years and 19% of individuals aged 20–92 years. Despite the high prevalence, subjective complaints do not accurately reflect the real disturbance experienced by the patient, and usually go unnoticed.

Summary

Current information in literature highlights the need for additional studies that concentrate on the impact of olfactory dysfunction on the quality of life of patients affected by allergic rhinitis.

Keywords

allergic rhinitis, nasal obstruction, olfaction, quality of life, smell impairment

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Introduction

Allergic rhinitis is a common inflammatory condition, affecting 9.9–16% of the US population [1•] and 18.7% of patients across Europe, with highest prevalence in the UK (21.8%) and Germany (20.5%) and lowest in Italy (16.1%) and Spain (15.1%) [2•].

Allergic rhinitis has a relevant impact on the quality of life (QoL) of affected patients, as demonstrated by the recently published guidelines of the WHO–Allergic Rhinitis and its Impact on Asthma (ARIA) that changed the assessment of the disease severity from an allergen-based to a QoL-based scale by grouping patients according to the duration and impact of symptoms on their daily activities rather than the type of allergen. Among others, impairment of smell is an important factor that influences the QoL in patients with allergic rhinitis; nevertheless, it is often neglected by patients and overlooked by physicians. The purpose of the present review is to evaluate how relevant smell dysfunction is in patients suffering from allergic rhinitis and how does it affect their QoL.

Smell impairment and allergic rhinitis

The sense of smell plays fundamental roles in everyday life such as determining the flavour of food and beverages, the appreciation of flowers and other pleasant odours and the full tasting of environmental changes such as season and climate variations. It also serves as an early warning against polluted air, spoiled foods, natural gas, toxins and other pollutants. Smell dysfunction can have a significant impact on the QoL, as it can lead to a wrong choice of food and intake, a reduction in appetite and eventually to weight loss, malnutrition, immunity reduction and worsening of medical illness [3]. Moreover, patients with a smell impairment are reported to use larger quantities of sugar and salt to highlight flavours, thus worsening their general health condition and increasing the risk of developing diabetes and hypertension [4,5].

Recent studies estimate that a complete loss of the sense of smell (anosmia) can be found in at least 1% of the US population [6], and that impairment in the olfactory function (hyposmia) can be highlighted in about 24% of individuals aged 53–97 years [7] and in 19% of

individuals aged 20–92 years [8]. Despite the high prevalence, subjective complaints do not always accurately reflect the real disturbance experienced by the patient, and usually go unnoticed [9]. Olfactory impairment is often associated with taste dysfunction; approximately two thirds of patients with olfactory loss also refer taste impairment; however, a detectable decrease in the gustatory function is present in less than 5% of patients with such disorders [10].

There are three major causes of smell impairment, accounting for 60% of all causes: head injury (20%), infections of the upper respiratory tract (20%) and sinonasal disease (20%). Other causes include congenital olfactory impairment, exposure to toxic substances and iatrogenic causes. The remaining of such chemosensory disorders can be classified as idiopathic [11–14]. Defining the aetiology of the olfactory impairment is relevant to the QoL assessment as an acute loss; for example, when it follows a head trauma or an acute infection, it will be perceived as more severe than a gradual loss, for example, in sinonasal disease.

Numerous techniques are currently available to evaluate the degree of olfactory dysfunction in humans, including odour identification, odour threshold, odour discrimination, odour memory and retronasal perception. Odour identification and odour threshold methods are the most commonly used and available tests.

Many studies have assessed the degree of olfactory impairment in patients suffering from allergic rhinitis. One of the first studies available in literature is that by Hotchkiss [15] in 1956, who reported that, among four patients with allergic rhinitis, two complained of a mild smell loss and two of moderate smell impairment. Decades later, a larger study of olfactory function in allergic rhinitis patients was published by Cowart *et al.* [16] in 1993, which demonstrated that patients affected by allergic rhinitis had significantly higher odour thresholds than the control group, with 23.1% of patients reporting a clinically significant loss. Furthermore, the study divided the allergic patients into a group with radiological evidence of rhinosinusitis and a group with no evidence of associated rhinosinusitis. Among patients with associated rhinosinusitis, 42.9% reported a smell dysfunction, whereas only 14.3% of allergic patients with no rhinosinusitis reported an olfactory impairment. Apter *et al.* [17] in 1995 confirmed these data on a personal casistic. An extensive study of the relationship between olfaction and rhinitis has been published by Simola and Malmberg [18], who compared the odour detection threshold in 105 patients with rhinitis and 104 healthy participants, confirming smell impairment in the former. In the same study, Simola and Malmberg compared the smell function in patients affected by allergic and nonallergic rhinitis, finding that patients in

the nonallergic rhinitis group experienced a higher loss in smell than allergic patients. In a different study, Apter *et al.* [19] compared the olfactory function in allergic patients referring to an allergy clinic and hyposmic patients presenting to a smell clinic who were also found to be allergic. As a result, all patients were found to present an alteration in their olfactory function, and patients who presented to the smell clinic to have higher odour impairment.

Another study by Klimek and Eggers [20] evaluated the olfactory function in 17 normosmic patients with allergic rhinitis during allergen exposure, finding a significant decrease in threshold and identification between the third and 14th day of the season and a moderate hyposmia in the mean, therefore demonstrating that patients with allergic rhinitis develop a significant olfactory dysfunction under allergen exposition.

Smell impairment and quality of life

QoL is the degree of well being felt by an individual or a group of people or, when referred to a specific health condition and according to a generally accepted definition, ‘the functional effects of an illness and its therapy upon a patient, as perceived by the patient himself’. Unlike standard of living, QoL is not a tangible concept and therefore cannot be measured directly. Furthermore, QoL consists of two components. The first is a physical aspect that includes things such as health, diet and protection against pain and disease. The second component is psychological in nature. This aspect includes things such as stress, worry, pleasure and other positive or negative emotional states. Many recent medical studies focused on the measurement of health-related QoL (HRQoL) rather than a more global conceptualization of QoL. The studies also focused on measuring HRQoL from the perspective of the patient and thus take the form of self-completed questionnaires, which appear to be the most accurate method for this purpose when done in large groups.

QoL can be measured using multiple questionnaires such as the Beck’s Depression Inventory (BDI) [21], the Mood Inventory [22], the Short-Form-36 Health Survey (SF-36) [23], the General Well Being Schedule (GWBS) [24], the Munich Life Dimension List (MLDL) [25] and the Visual Analogue Scale for Quality of Life (VAS-QoL) [26]. More specific questionnaires focusing on nasal disorders and olfactory impairment have been published; among them, one of the most important is the Questionnaire for Olfactory Dysfunction (QOD), composed of 52 questions divided into three areas (degree of suffering, positive effects and coping strategies, socially desired statements); its logic resembles that used for tinnitus questionnaires [6]. Another specific questionnaire is the Sinonasal Outcome Test-16, which uses three questions to let the patient indicate the degree of nasal dysfunction [27]. Other

questionnaires built specifically to investigate the olfactory function have been introduced by Nordin *et al.* [28] (the Multiclinic Smell and Taste Questionnaire), Hufnagl *et al.* [29], Varga *et al.* [30] and Bousquet *et al.* [31].

In allergic rhinitis, the most frequently used questionnaire is the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) published by Juniper and Guyatt [32], which includes 28 questions divided into several groups (nasal symptoms, ocular symptoms, general symptoms, sleeping disorders, practical problems, limitation of activity, emotional disorders). A shorter version of the RQLQ (mini-RQLQ) was released in 2002, consisting of 14 questions and proven to have strong measurement properties [33]; other versions of RQLQ (children RQLQ, nocturnal allergic rhinoconjunctivitis RQLQ) have been released afterwards [34,35]. Another rhinitis-specific QoL questionnaire, the Rhinitis Symptom Utility Index (RSUI), was compiled by Revicki *et al.* [36] in 1998.

One of the most recent questionnaires to investigate how allergic rhinitis symptoms influence the QoL is the ESPRINT-28, developed for Spanish-speaking patients. In its form, it asked patients to rate 58 common nasal and nonnasal symptoms. Using this questionnaire, olfactory impairment has been ranked 38th, with a mean score frequency of 3.55 [37].

Several authors have shown that olfactory dysfunction severely affects the QoL of affected patients. Negative effects on mood, enjoyment of food, matters of safety, personal hygiene, social interaction and sexual life (Varga *et al.* [30], Hufnagl *et al.* [29]) as well as signs of depression in 29% of patients (Deems *et al.* [10]) have been found. In another study, Miwa *et al.* [38] showed that the overall satisfaction with life was reduced by 50%, and 25% of patients reported enjoying life less than they did before the onset of olfactory dysfunction. In this study, the most important complaint was the inability to detect spoiled food (75% of patients), followed by gas leaks (61%) and smoke (50%), as well as problems in eating (53%) and cooking (49%). In a different work, Temmel *et al.* [9] reported that among the many complaints due to olfactory loss, the main ones were related to food: 73% of patients complained of difficulties in cooking, 56% of low appetite and 50% of eating spoiled food. The same study also revealed that 68% of patients experienced mood changes, 41% poor perception of one's own body odour, 30% complained about spoiling or burning food and 8% about problems at work [9]. A much higher impact on QoL has been reported in a study by Nordin *et al.* [39] on patients with anosmia and hyposmia, that showed a reduction of QoL in 77% of patients, an increased risk perception in 75%, a negative change in the daily routine in 63%, an affection of the general health in 34% and the onset of depression in 17% of the enrolled patients.

Furthermore, important elements such as financial security, profession, friendship, partnership, emotional stability and leisure were reported to be affected by the olfactory disorder.

The loss in QoL seemed to be of greater importance in younger than in older people and in women than in men [40]. However, it is not only a reduction in the sense of smell (hyposmia, anosmia) that affects the patient's well being. Qualitative distortions in olfaction seem to be more upsetting to a person's QoL than a simple loss (Leopold *et al.* [41]).

Quality of life and allergic rhinitis

Many studies focused on evaluating the changes in QoL in patients with allergic rhinitis. Ciprandi *et al.* [42^{*}] evaluated the QoL in allergic patients using the RQLQ test and reported a significantly better QoL in patients with a decongestion of more than 34% and in patients with less than two sensitivities, whereas a poorer QoL in patients with high levels of eosinophils was reported. In addition, higher symptom scores were associated with lower QoL for sneezing, itching and nasal obstruction. Patients with decongestion of more than 34% had a higher QoL in the eye symptom and the nasal symptom areas, whereas patients with less than two sensitivities had a better QoL on the sleep and eye symptom scales. Higher symptom scores were associated with a lower QoL for sneezing on the nasal symptom, practical problem and activity scales; for itching on the activity and practical problem scales; and for nasal obstruction on the activity scale. Patients with higher levels of eosinophil presented a worse QoL on the practical problem, activity, nasal symptom, eye symptom and emotion scales.

Kremer *et al.* [43] used both specific (RQLQ) and generic (MLDL and VAS-QoL) questionnaires to evaluate the QoL in patients with allergic rhinitis, also comparing patients with symptomatic and asymptomatic perennial allergic rhinitis (PAR) and patients with seasonal allergic rhinitis (SAR). Among them, symptomatic patients with PAR or SAR judged their QoL significantly worse than asymptomatic patients, and symptomatic patients with SAR reported a worse QoL than symptomatic patients with PAR. In detail, there were highly significant discrepancies ($P < 0.0001$) between symptomatic and asymptomatic subjects on all scales of the RQLQ. The detailed analysis of the scales showed that allergic rhinoconjunctivitis shows the worse reduction in QoL, especially due to nasal and eye symptoms. Instead, the ability to interact in everyday life was less affected.

Meltzer [44] carried out a population-based study to assess health-related QoL in patients affected by allergic rhinitis. Statistically significant differences between

allergic and healthy individuals were found on all subscales of RQLQ, showing a poorer QoL in patients with allergic rhinitis.

An interesting study by Blomqvist *et al.* [45] at the Karolinska Institute of Stockholm in 2004 evaluated the QoL in 72 patients complaining of olfactory loss using the Multiclinic Smell and Taste Questionnaire. About 66% of patients reported a decline in their QoL, with highest complaints about personal hygiene, eating and drinking, difficulty with cooking, interference with daily routine and depression. A total of 20.8% of patients reported a moderate distress and 27.8% a severe distress. About 90% of patients stated that they became more aware of the importance of the sense of smell compared with the period before the sense loss. Many patients adopted coping strategies such as the tendency to accept the situation, ask a family member to taste the food that might be spoiled, seek information, ask a relative to check whether one had used the right amount of perfume and compare their problems with those who had worse symptoms.

A large study on the impact of allergic rhinitis symptoms on general QoL has been recently published by Bousquet *et al.* [46], who assessed the impairment incurred by allergic rhinitis on 3052 patients aged between 18 and 80 years. QoL was assessed by the RQLQ. Patients were divided into four groups based on the ARIA classification (mild intermittent, moderate–severe intermittent, mild persistent, moderate–severe persistent). Among them, 47.2% of patients reported a loss of smell (mild intermittent, 21.1%; moderate–severe intermittent, 48.2%; mild persistent, 33.7%; moderate–severe persistent, 49.3%); hyposmia was also reported to be associated with the severity of the disease.

Conclusion

Although there are many studies that singularly evaluate the impact of olfactory impairment in allergic rhinitis and in patient's QoL, very little has been published about the combination of olfactory impairment, allergic rhinitis and QoL. This is not surprising as, even if disturbances in the sense of smell are quite common, they are usually overlooked by physicians and undetected by patients who are able to continue their social and professional activities. Furthermore, no standardized tools for a correct assessment of olfactory impairment and QoL had been available in the past; these tools are now being routinely used in daily practice. Also, many studies presented several limitations due to the low number of participants, the lack of appropriate evaluation tools and the limited importance given to olfactory loss among other symptoms.

That said, the studies that evaluated the impact of smell dysfunction in allergic rhinitis have generally found an

association between the degree of smell loss and the severity of nasal symptoms, which are known to play a major role in worsening the QoL. Nevertheless, it has been proved that the QoL deteriorates after the onset of a loss of smell, including adverse effects on appreciation of food, interference with daily routine, physical health, financial security, profession, emotional stability, leisure and a general worsening in well being. Also, the importance of olfaction becomes more evident after its loss, and patients adopt several coping strategies.

In conclusion, the current information available in literature highlights the need for additional studies that concentrate on the impact of olfactory dysfunction on the QoL of patients affected by allergic rhinitis.

References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

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Additional references related to this topic can also be found in the Current World Literature section in this issue (p. 278).

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