

Yearly incidence of rhinitis, nasal bleeding, and other nasal symptoms in mature women*

Valerie J. Lund¹, Paul Preziosi², Serge Hercberg³, Marc Hamoir⁴, Christian Dubreuil⁵, Jean Jacques Pessey⁶, Dominique Stoll⁷, Michel Zanaret⁸, Pierre Gehanno⁹

¹ Institute of Laryngology and Otology, Royal National Throat, Nose and Ear Hospital, London, United Kingdom

² Conservatoire National des Arts et Métiers, Institut Scientifique et Technique de la Nutrition et de l'Alimentation, Paris, France

³ U557 INSERM (UMR INSERM/INRA/CNAM), Conservatoire National des Arts et Métiers, Institut Scientifique et Technique de la Nutrition et de l'Alimentation, Paris, France

⁴ Université Catholique de Louvain, St Luc University Hospital, Brussels, Belgium

⁵ CH Lyon Sud, Pierre Benite, France

⁶ Service d'ORL et de Chirurgie Cervico-Faciale, Hôpital LARREY, Toulouse, France

⁷ Service ORL, Groupe Hospitalier Pellegrin, Bordeaux, France

⁸ Hôpital la Timone, Service Fédération ORL, Marseille, France

⁹ Hôpital Bichat, Paris, France

SUMMARY

Objectives/Hypothesis: To evaluate, by a prospective questionnaire study, the incidence of spontaneous nasal pathology in mature women over a 12-month period, in particular nasal bleeding and the relationships of these symptoms with various factors.

Methods: Participants were drawn from a sample of 12,735 adult French volunteers participating in a study of antioxidant nutrients ("SU.VI.MAX"); 3500 women aged 50–64 years were randomly selected from good responders in the SU.VI.MAX population. The responses of 2197 women were analysed.

Results: Nearly 70% of subjects reported at least one episode of rhinitis, with a mean (SD) of 1.88 (2.17) episodes per subject. Rhinitis was related to passive exposure to tobacco smoke (adjusted odds ratio [OR] 1.31, 95% CI 1.05–1.63), menopause (OR 1.47, 95% CI 1.16–1.88), and occupational exposure to vapours or dusts (OR 1.55, 95% CI 1.01–2.37). Nasal bleeding was reported as traces of blood by 16.5% of subjects, and as epistaxis (significant nasal bleeding) by 7.6%. Both symptoms were related to passive exposure to tobacco smoke (OR 1.63, 95% CI 1.22–2.19; OR 1.56, 95% CI 1.05–2.32, respectively) but not to use of systemic or topical medication.

Conclusion: A substantial number of mature women experience nasal symptoms during the course of a year. Rhinitis and nasal bleeding were correlated with passive exposure to tobacco smoke.

Key words: hormone replacement therapy; nasal bleeding; nasal symptoms; rhinitis

INTRODUCTION

Rhinitis, epistaxis and other nasal symptoms are among the most common conditions presenting to physicians, and thus incur considerable healthcare costs [1,2]. Allergic rhinitis is well defined and its epidemiology and importance have been reported [3–5]. However, few data are available on the incidence of, and risk factors for, non-allergic nasal symptoms [6].

The intranasal route is increasingly being considered for the delivery of systemic endocrine preparations, such as hormone replacement therapy (HRT). Intranasal administration is generally well tolerated, although it may be associated with some

local symptoms (e.g. nasal bleeding, sneezing, itching and nasal discharge) [7,8]. Comparing the occurrence of these symptoms with their incidence in the general population is difficult due to the lack of epidemiological data in the literature.

The primary aim of this study was to evaluate the incidence of spontaneous nasal pathology (rhinitis, nasal bleeding, and other nasal symptoms) in mature women over a 12-month period to provide baseline data. The relationship of these symptoms with various factors such as menopausal status, smoking, medication use and exposure to pollutants, was also investigated.

METHODS

Participants

SU.VI.MAX (SUplémentation en Vitamines et Minéraux AntioXydants) is a large 8-year study, assessing the effect of antioxidant nutrients on the incidence of cancer and cardiovascular disease in 12,735 adult French volunteers [9]. SU.VI.MAX relies on participants completing monthly questionnaires to report health events [9] and therefore provided an opportunity to introduce specific nasal symptom questionnaires. Ethical approval for the SU.VI.MAX study, including the monitoring of all health-related events, was granted by the "Comité Consultatif pour la Protection des Personnes se prêtant à la Recherche Biomédicale" (CCPPRB n° 706) of Paris-Cochin.

The current study was undertaken on a sub-group of 3500 women from the SU.VI.MAX cohort, aged between 50 and 64 years of age. The women were randomly selected, stratified according to age and region of residence, from the cohort who had shown a good response rate to the various questionnaires involved in the SU.VI.MAX study. Data on menopausal status, HRT and tobacco use, and educational level were taken from the SU.VI.MAX database which was updated for this study.

Recording and classification of events

This epidemiological study recorded all nasal events experienced by participants during 1999. Specific questionnaires, designed by an expert committee of European ear, nose and throat experts, were used to obtain a complete record of nasal symptoms. The questionnaires included a baseline nasal history form, a monthly form to record the days when symptoms were experienced, and specific forms related to each category (rhinitis, nosebleed, and other symptoms). Rhinitis events were initially classified according to their presumed primary etiology in terms of reference definitions: infectious rhinitis [10,11] (ie, the common cold) and non-infectious rhinitis including both allergic and non-allergic hyperactivity [12,13]. The latter also included cases that were suggestive of allergic rhinitis but lacked definitive evidence of an allergic etiology. When reported symptoms were too scarce or non-specific to be grouped into one of the above categories, events were recorded as "unclassified rhinitis". Nasal bleeding was divided into traces of blood on blowing the nose and epistaxis (significant nasal bleeding).

Statistical analysis

Statistical analysis was performed using SAS software (SAS Institute Inc., Cary, NC, USA). Associations between nasal symptoms and various factors were studied using logistic regressions, modelling the likelihood of experiencing at least one event during the year and adjusting for age and current tobacco use.

RESULTS

Among the 3500 women selected, 2634 returned the baseline form and 2598 returned forms for at least the first quarter. It was considered that subjects who returned at least one form in the fourth quarter were likely to have reported all nasal events and were therefore eligible for analysis. The study population included 2197 women who fulfilled this criterion.

A comparison was made between the number of rhinitis and nosebleed events reported during the first quarter of 1999 by subjects who completed the study and those who did not return forms after the first quarter. This comparison showed that there were no relevant differences between the rates reported by the two groups, thus validating the study population.

Baseline characteristics

The socio-demographic characteristics of participants in the study are shown in Table 1 and their nasal history in Table 2. The most frequently reported chronic nasal symptom was obstruction, reported by 6.4% of participants.

Table 1. Socio-demographic characteristics of participants (n=2197).

Age (years)	
Mean \pm SD	55.6 \pm 4.7
50-54	48%
55-59	27%
60-64	25%
Education level	
Primary	22%
Secondary	43%
Tertiary	35%
Occupation	
Farmers/self-employed	4%
Managers/intermediate	49%
Employed/labourers	18%
Not working	29%
BMI (kg/m²)	
Mean \pm SD	23.3 \pm 3.6
\leq 25	81%
25-30	15%
> 30	4%
Menopausal women	74%
Hormone replacement therapy (among menopausal women)	69%
Climatic area	
Oceanic (north)	56.3%
Oceanic (south)	12.8%
Continental	14.9%
Mountain	6.1%
Mediterranean	9.9%
Population density (inhabitants/km²)	
Mean \pm SD	3004 \pm 5236
\leq 500	44.1%
500-2000	22.2%
> 2000	33.7%

Rhinitis

One or more rhinitis events of any sort were reported by 69.5% of subjects, with a greater incidence being noted in the winter months (15.1% and 11.8% of recorded events were reported in January and February, respectively, versus 4% in August). The mean incidence of different rhinitis symptoms, and percentage of subjects reporting at least one rhinitis symptom, are shown in Table 3. Sneezing, irritating cough, and itchy eyes were the most common rhinitis symptoms.

Adjusted odds ratios (ORs) for the occurrence of rhinitis in relation to tobacco use (current, former and passive), the menopause, HRT, occupational exposure to vapours or dusts, and air conditioning, are shown in Table 4. A correlation was

found between rhinitis and passive exposure to tobacco smoke, menopause, and occupational exposure to vapours or dusts.

When the results for rhinitis were analysed by type, 60.8% of subjects reported at least one episode of infectious rhinitis, 27.8% one episode of “non infectious rhinitis”, and 13.5% one episode of unclassified rhinitis. The incidence of infectious rhinitis was higher in menopausal women (OR 1.37, 95% confidence interval [CI] 1.09–1.73), but no link was found with the use of HRT. “Non-infectious rhinitis” was reported more frequently by subjects exposed to vapours and dusts or to air conditioning in the workplace (OR 2.03, 95% CI 1.36–3.03; OR 1.62, 95% CI 1.17–2.23, respectively).

Table 2. Nasal history and relevant cofactors in medical history.

Condition	Percentage of subjects
History of seasonal rhinitis	8.7
Chronic symptomatology	
Obstruction, one side	6.4
Obstruction, both sides	5.1
Disturbance of smell and/or taste	3.8
Rhinorrhoea	2.6
Surgical history	
Adenoidectomy	8.6
Septoplasty	8.3
Fracture	3.8
Cauterisation	2.6
Rhinoplasty	1.1
Other	1.9
Tobacco use	
Never	59
Former	30
Current	11
Passive exposure to tobacco smoke (among never or former smokers)	70
Air conditioning at workplace	11.7
Occupational exposure to vapours or dust	5.8

Nasal bleeding

Among the subjects, 24.1% reported at least one incident of either traces of blood (16.5%) or epistaxis (7.6%). Most of these episodes appeared mild since medical consultation was sought in <4% of cases and no action or self-administered nasal compression was undertaken in 69% of events. The incidence of both types of nasal bleeding was greater during the winter months. Nonetheless, 62.5% of episodes occurred spontaneously and only 37.5% during the course of a defined episode of rhinitis.

The episodes occurred without preceding use of aspirin or other non-steroidal anti-inflammatory (NSAIDs) drugs in 80.3%. Use of topical nasal medication was low, including the use of topical corticosteroids (4.4%) and there was no correlation between this and spotting of blood or frank epistaxis. Only 2% of those experiencing nasal bleeding had used topical corticosteroids. However, the occurrence of both spotting of blood and epistaxis was related to passive exposure to tobacco smoke (OR 1.63, 95% CI 1.22–2.19 and OR 1.56, 95% CI 1.05–2.32, respectively).

Table 3. Mean incidence of rhinitis symptoms, and subjects reporting at least one occurrence of the symptom in a rhinitis context.

	Number of rhinitis episodes where the symptom was reported		Subjects reporting ≥ 1 occurrence (%)
	Mean	SD	
Disturbance of smell and/or taste	0.40	1.86	22.5
Maxillary pain	0.48	1.10	26.1
Frontal pain	0.22	0.74	13.3
Sneezing	1.52	2.13	60.0
Itchiness	0.53	1.28	26.3
Itchy eyes	0.61	1.36	29.5
Dry cough	0.64	1.14	37.8
Productive cough	0.39	0.93	24.9
Asthma attack	0.07	0.56	3.1
Fever	0.30	0.66	22.0
Myalgia	0.41	0.92	25.2
Fatigue	0.64	1.15	37.6
Overall number of rhinitis episodes per subject	1.88	2.17	69.5%

Table 4. Relationship between rhinitis and various factors.

	n	Subjects reporting ≥ 1 occurrence (%)	Adjusted OR ^a	95% CI
Tobacco consumption				
No	1287	68.8	1.00	
Current	235	69.8	1.06	0.8–1.4
Former	675	71.0	1.12	0.9–1.4
Passive exposure to tobacco smoke				
No	546	66.8	1.00	
Yes	1217	72.6	1.31	1.0–1.6
Menopause				
No	565	64.1	1.00	
Yes	1595	71.3	1.47	1.2–1.9
Hormone replacement therapy				
No	451	69.4	1.00	
Yes	1021	71.8	1.09	0.8–1.4
Occupational exposure to vapours or dusts				
No	2069	69.1	1.00	
Yes	128	77.3	1.55	1.0–2.4
Air conditioning at workplace				
No	1766	72.5	1.00	
Yes	233	76.0	1.22	0.9–1.7

^aAdjusted for age and current tobacco use.

Neither type of nasal bleeding was correlated with menopausal status. The incidence of traces of blood events was lower in subjects receiving HRT compared with those who were not (OR 0.73, 95% CI 0.54–0.97).

Other nasal symptoms

Sneezing, itchiness, dry nose, anosmia, nasal obstruction, crusts, and itchy eyes which occurred in isolation, and therefore did not fit into one of the rhinitis classifications, were considered as “other nasal symptoms”. The incidence of each of these is shown in Table 5; 25.6% of subjects reported at least one event in this category. Adjusted odds ratios for these symptoms in relation to passive smoking were greater than 1, but the relationship was significant only for sneezing.

Other correlations

None of the symptoms considered above (rhinitis, nosebleed or other nasal symptoms) were correlated with climatic area or population density, with the exception of crusts and itchy eyes,

which showed an increased OR for subjects in a southern relative to a northern oceanic climatic area.

DISCUSSION

Minor nasal symptoms (epistaxis, sneezing, crusting) have been reported during the course of treatment with intranasal preparations including oestrogen [8] and corticosteroids [7] and adult epistaxis is known to be associated with use of NSAIDs [14]. It is uncertain whether these nasal symptoms can be attributed to the condition being treated, local irritation of the nasal mucosa, or a direct effect of the drugs themselves. Until now, it has also been uncertain how these symptoms compare to those experienced in the general population, due to the lack of good epidemiological data documenting their incidence.

This study investigated the incidence of spontaneous nasal events in the target group of women aged 50–64 to provide specific baseline data for use in assessing the possible side-effects of intranasal delivery of medication such as HRT. This group is clearly not representative of the wider population but it may be possible to make some extrapolation of the results, supported by a survey investigating the prevalence of non-allergic nasal complaints experienced by individuals in Sweden, which reported that there were no differences between genders in any age group [15]. However, other studies have reported allergic and non-allergic rhinitis to be more common in females than males [6,16], and non-allergic rhinitis to be more prevalent in younger age groups (20–30 years) than those included in the current study [15].

The participants in this study were drawn from SU.VI.MAX, a large 8-year study of 12,735 adult French volunteers; in general, the composition of the cohort (and thus also the current study sample) resembled that of the entire French population for the age groups concerned, but it did contain a greater proportion of middle and upper-middle class subjects than seen in the general population [9]. This bias could result in an underestimate of any environmentally related nasal conditions that result from the poorer housing and working conditions experienced by less wealthy individuals. The fact that no correlation was found between the incidence of nasal symptoms and climate or population density must therefore be treated with caution.

Table 5. Incidence of other nasal symptoms, extent to which these were perceived as bothersome, and relationship with passive smoking.

Symptom	Subjects reporting ≥ 1 occurrence (%)	Perceived as bothersome (% of reports)	Adjusted OR for passive smoking (95% CI) ^a
Sneezing	4.0	17	1.95 (1.03–3.69)
Itchiness	4.2	24	1.58 (0.93–2.70)
Dry nose	6.9	24	1.21 (0.79–1.84)
Disturbance of taste and/or smell	14.8	44	1.26 (0.94–1.69)
Obstruction	5.2	25	1.61 (0.97–2.67)
Crusts	8.3	20	1.20 (0.82–1.74)
Itchy eyes	9.0	31	1.41 (0.97–2.04)

^aOR is adjusted for age and current tobacco use and expressed relative to an OR of 1.0 for subjects not exposed to passive smoking.

Further bias may arise because subjects were required to complete numerous forms, and those with more than one symptom may have been discouraged from reporting them all. In fact, some subjects returned complete sets of monthly forms, often accompanied by events forms; others appeared to return forms only when they had events to report. Furthermore, those returning fewer forms tended to report more serious events than those returning many forms. Therefore, analysing only complete sets of monthly forms may have biased the results by selecting subjects more likely to report mild events. In an attempt to avoid skewing the results, the decision was made that subjects who returned at least one form in the fourth quarter were likely to have reported all nasal events (except, possibly, minor ones) and were therefore eligible for analysis.

For all the reasons listed above, the overall results of the study cannot be regarded as definitive measures of incidence, but rather as a guide to the frequency of nasal symptoms in a largely undocumented area.

In the current study, the only factor consistently correlated with the incidence of nasal symptoms for all categories of rhinitis and nasal bleeding, was passive exposure to tobacco smoke. Results from the European Respiratory Health Survey showed a correlation between exposure to tobacco smoke and various respiratory symptoms, although there was no association between passive smoking and current allergic rhinitis or asthma [17]. The current study also reported a correlation between the incidence of "non-infectious rhinitis" and occupational exposure to vapours and dust. There have been previous reports of a similar correlation between rhinitis and workplace exposure to dust [18,19] or air conditioning [20].

In the current study, there was no correlation between nasal bleeding overall and menopausal status or use of HRT or other medication. A retrospective analysis of hospital admissions over a 5-year period demonstrated that the incidence of epistaxis requiring hospital attention is similar in men and women [21]. However, in the patients aged between 20 and 49 years, twice as many males as females were admitted to hospital with epistaxis, suggesting the pre-menopausal state in women may provide protection against this condition. This could be related to the fact that oestrogen levels are higher in premenopausal women, and oestrogen receptors are known to be present on the nasal mucosa [22]. The lower incidence of traces of blood in women receiving HRT that was observed in the current study could also possibly be related to higher estrogen levels in these women, relative to women not receiving HRT.

The current study demonstrates that a substantial number of individuals experience nasal symptoms during the course of a year; therefore, the local symptoms associated with intranasal preparations must be seen in this context.

In conclusion, a significant number of individuals in the current study experienced a range of nasal symptoms during the course of a year. Furthermore, these symptoms were consistently correlated with passive exposure to tobacco smoke.

ACKNOWLEDGEMENTS

The Institut de Recherches Internationales Servier, France, funded this study.

REFERENCES

1. Turkeltaub PC, Gergen PJ (1988) The prevalence of allergic and nonallergic respiratory symptoms in the US population: data from the Second National Health and Nutrition Examination Survey 1976-80 (NHANES II). *J Allergy Clin Immunol* 81: 305.
2. Scadding GK, Richards DH, Price MJ (2000) Patient and physician perspectives on the impact and management of perennial and seasonal allergic rhinitis. *Clin Otolaryngol* 25: 551-557.
3. Bellanti JA, Wallerstedt DB (2000) Allergic rhinitis update: epidemiology and natural history. *Allergy Asthma Proc* 21: 367-370.
4. Crystal-Peters J, Crown WH, Goetzel RZ, Schutt DC (2000) The cost of productivity losses associated with allergic rhinitis. *Am J Manag Care* 6: 373-378.
5. Skoner DP (2001) Allergic rhinitis: definition, epidemiology, pathophysiology, detection, and diagnosis. *J Allergy Clin Immunol* 108 (1 Suppl): S2-S8.
6. Settipane RA, Lieberman P (2001) Update on nonallergic rhinitis. *Ann Allergy Asthma Immunol* 86: 494-507.
7. Drouin M, Yang WH, Bertrand B, Van Cauwenberge P, Clement P, Dalby K, Darnell R, Ernst TM, Hebert J, Karlsson G, Luciak G, Mazza J, Roovers M, Ruoppi P, Seppey M, Stern M, Suonpaa J, Sussman G, Tan KY, Tse K, Widjaja P, Jensen P, Nolop K, Lutsky BN (1996) Once daily mometasone furoate aqueous nasal spray is as effective as twice daily beclomethasone dipropionate for treating perennial allergic rhinitis patients. *Ann Allergy Asthma Immunol* 77: 153-160.
8. Studd J, Pornel B, Marton I, Bringer J, Varin C, Tsouderos Y, Christiansen C (1999) Efficacy and acceptability of intranasal 17-oestradiol for menopausal symptoms: randomised dose-response study. *Lancet* 353: 1574-1578.
9. Hercberg S, Preziosi P, Briançon S, Galan P, Triol I, Malvy D, Roussel AM, Favier A (1998) A primary prevention trial using nutritional doses of antioxidant vitamins and minerals in cardiovascular diseases and cancers in a general population: the SU.VI.MAX study - design, methods, and participant characteristics. *Control Clin Trials* 19: 336-351.
10. International Rhinosinusitis Advisory Board (1997) Infectious rhinosinusitis in adults: classification, etiology and management. *Ear Nose Throat J* 76 (12 Suppl): 1-22.
11. Lanza D, Kennedy D (1997) Adult rhinosinusitis defined. *Otolaryngol Head Neck Surg* 117: S1-S7.
12. Anon (1994) Definition and classification of rhinitis. *Allergy Supplement* 19: 5-34.
13. van Cauwenberge P, Bachert C, Passalacqua G, Bousquet J, Canonica GW, Durham SR, Fokkens WJ, Howarth PH, Lund V, Malling HJ, Mygind N, Passali D, Scadding GK, Wang DY (2000) Consensus statement on the treatment of allergic rhinitis. *Allergy* 55: 116-134.
14. Watson MG & Shenoi PM (1990) Drug-induced epistaxis? *J Royal Soc Med* 83: 163-164.
15. Jessen M, Janzon L (1989) Prevalence of non-allergic nasal complaints in an urban and a rural population in Sweden. *Allergy* 44: 582-587.
16. Enberg RN (1989) Perennial nonallergic rhinitis: a retrospective review. *Ann Allergy* 63: 513-516.
17. Janson C, Chinn S, Jarvis D, Zock J-P, Toren K, Burney P, for the European Community Respiratory Health Survey (2001) Effect of passive smoking on respiratory symptoms, bronchial responsive-

- ness, lung function, and total serum IgE in the European Community Respiratory Health Survey: a cross-sectional study. *Lancet* 358: 2103-2109.
18. Love RG, Smith TA, Gurr D, Soutar CA, Scarisbrick DA, Seaton A (1988) Respiratory and allergic symptoms in wool textile workers. *Br J Ind Med*; 45: 727-741.
 19. Liebers V, Hoernstein M, Baur X (1993) Humoral immune response to the insect allergen *Chi t I* in aquarists and fish-food factory workers. *Allergy* 48: 236-239.
 20. Robertson AS, Burge PS, Hedge A, Sims J, Gill FS, Finnegan M, Pickering CA, Dalton G (1985) Comparison of health problems related to work and environmental measurements in two office buildings with different ventilation systems. *Br Med J* 291: 373-376.
 21. Tomkinson A, Roblin DG, Flanagan P, Quine SM, Backhouse S (1997) Patterns of hospital attendance with epistaxis. *Rhinology* 35: 129-131.
 22. Barni T, Maggi M, Fantoni G, Granchi S, Mancina R, Gulisano M, Marra F, Macorsini E, Luconi M, Rotella C, Serio M, Balboni GC, Vannelli GB (1999) Sex steroids and odorants modulate gonadotropin-releasing hormone secretion in primary cultures of human olfactory cells. *J Clin Endocrinol Metab* 84: 4266-4273.

Valerie J. Lund, MS FRCS FRCSEd
Professor of Rhinology
Institute of Laryngology and Otology
Royal National Throat, Nose and Ear Hospital
330 Gray's Inn Road
London WC1X 8DA,
United Kingdom

Tel: +44-207-915-1497

Fax: +44-171-833-9480

Email: v.lund@ucl.ac.uk