

INVESTIGATIVE REPORT

Prevalence of Rosacea in an Estonian Working Population Using a Standard Classification

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Data about the prevalence of rosacea are scarce. The aim of this study was to evaluate the prevalence rate of rosacea according to the American National Rosacea Society Expert Committee (NRSEC) classification. A cross-sectional study of 348 subjects randomly selected from a working population ≥ 30 years of age was performed. All subjects completed a questionnaire. Skin status was examined according to NRSEC criteria. Of the 348 subjects, 78 (22%) had one or more primary features of rosacea. The most common features were erythema (21%) and telangiectasia (18%). Of the subjects with rosacea, 78% had erythematotelangiectatic rosacea and 22% had papulopustular rosacea. Fifteen percent of the study subjects had experienced frequent episodes of flushing without permanent features of rosacea. No significant gender-related differences were found between study groups. In conclusion, according to the NRSEC, rosacea is a more common skin condition over the age of 30 years than previously thought. **Key words:** rosacea; prevalence; classification; age distribution; gender.

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Rosacea is a common chronic skin condition of unknown aetiology, which usually starts between the ages of 30 and 50 years (1). A number of clinical symptoms and signs have been included in the broad spectrum of rosacea. Standard diagnostic criteria are essential for research, analysis of results, and comparison of data from different sources (2). In 2002, the American National Rosacea Society Expert Committee (NRSEC) developed a worldwide accepted standard classification system for rosacea, which defined the criteria for the diagnosis and staging of rosacea (3). According to the NRSEC standard classification, one or more of the following signs with central face distribution is indicative of rosacea: transient or non-transient erythema, papules and pustules, and telangiectasia. Rosacea is divided into 4 subtypes and one variant: subtype 1/erythematotelangiectatic rosacea (ETR), subtype 2/papulopustular rosacea (PPR), subtype 3/phymatous rosacea (PR), subtype 4/ocular rosacea, and variant granulomatous rosacea.

Data about the prevalence of rosacea are scarce. Two previous population-based studies have found the prevalence rate of rosacea to range from 2% in Germany (4) to 10% in Sweden (5). Several studies on patients in dermatology clinics have established the prevalence rate of rosacea to be 0.5–3% on the basis of referrals to various dermatology centres (6–8).

To the best of our knowledge, all earlier studies addressing the prevalence of rosacea were initiated prior to the adoption of the NRSEC classification. The aim of the current study was to evaluate the prevalence rate of ETR, PPR and PR according to the NRSEC classification in a randomly selected sample of the working population, and to observe the subjective disease perception of subjects with primary features of rosacea.

MATERIALS AND METHODS

A cross-sectional study was carried out from May 2005 to December 2007 among employees of randomly selected institutions in Tartu. Tartu is the second largest city in Estonia, and the largest city in Southern Estonia, with approximately 100,000 inhabitants. The telephone directory was used for the random selection of institutions in Tartu. Written detailed information specifying the aim and design of the study was sent to every ninth institution from the alphabetical list in the telephone directory, and after a few days the head of the institution was contacted by telephone and, in the case of agreement, an appointment was made. Institutions with fewer than three employees aged ≥ 30 years were excluded. The investigation was carried out during the employees' working hours and all employees aged at least 30 years who were present on the day of the study were invited to participate.

Written information was sent to 140 selected institutions in Tartu. In 26 cases (19%) we failed to establish contact. Of the 114 contacted institutions 23 (20%) were excluded because they employed fewer than 3 persons aged ≥ 30 years. Thirty-one (27%) contacted institutions did not participate for different reasons: unsuitable organization of work ($n=18$), distrust of, or ambivalence toward, research ($n=5$), and other unclear reasons ($n=8$). Sixty (53%) institution leaders approved the study and the institutions were visited within a few days. Of the 60 complying institutions 4 dealt with medicine, 5 with education and science, one with transportation, one with entertainment, 4 with manufacturing, 21 with sales or service and 24 were various offices. Of the 524 potential study subjects 348 (66%) completed a questionnaire. A total of 176 subjects did not participate in the study because they were either too busy or were not present at their workplace during the visit, 102 of these (58%) were teachers from one and the same educational institution.

All subjects gave their written informed consent prior to enrolment in the study. The study subjects completed a ques-

tionnaire on demographic data, such as age and gender, and were interviewed about the presence of flushing episodes and subjective perception of rosacea symptoms. In addition, subjects described their sun-reactive skin type on the basis of reaction to 30 min of midday sunlight for the first time in summer (9). Skin types were categorized into two larger subgroups: photosensitive skin (Fitzpatrick I and II) and non-photosensitive skin (Fitzpatrick III and IV).

The skin status of the study subjects was examined by one and the same dermatologist according to the NRSEC standard classification criteria. Erythema, telangiectasia, and phymatous changes were graded according to the NRSEC Standard Grading System (10) as mild, moderate and severe; the number of papules and pustules on one side of the face were counted.

According to the condition of the facial skin, the subjects were classified into four subgroups, as follows: I, those with no signs or symptoms of rosacea were defined as the non-rosacea group; II, those who reported having transitory erythema episodes several times day were defined as the flushers group; III, those with persistent erythema and/or visible blood vessels (telangiectases) with no other disease of the facial skin were defined as the ETR group; and IV, those with papulopustular facial rash without comedones were defined as the PPR group. Although questions about ophthalmological complaints were also asked, ocular rosacea was not diagnosed separately, as the aim of the study was to evaluate the cutaneous subtypes of rosacea.

Continuous variables are shown as mean values (with standard deviation; SD), while qualitative variables are shown as absolute and relative frequencies with 95% confidence intervals (95% CI). To compare the groups' variables, the χ^2 test or the Fisher's exact test was used. Differences with a p -value < 0.05 were considered statistically significant. The data were analysed using the SAS 9.1 program.

The study protocol was approved by the ethics committee of the University of Tartu.

RESULTS

A total of 348 subjects, with a mean $\pm$ SD age of 44 ± 10 years (age range 30–77 years) were enrolled in the study. The characteristics of the study population (age, gender, skin type) are shown in Table I.

Seventy-eight of the 348 study subjects (22%; 95% CI 18–27%) had one or more primary features of rosacea. The most common features were erythema and telangiect-

Table II. Profile of observed skin changes among the study subjects ($n = 348$)

Type of skin changes	Subjects, n (%)
Erythema	
None	274 (79)
Mild	63 (18)
Moderate	10 (3)
Severe	1 (<1)
Telangiectasia	
None	284 (82)
Mild	54 (15)
Moderate	9 (3)
Severe	1 (<1)
Number of papules on one side of the face	
None	329 (95)
1–5	11 (3)
6–10	6 (2)
11–15	2 (<1)
Number of pustules on one side of the face	
None	341 (98)
1–5	7 (2)
>5	0 (0)

tasia. The profile of the observed skin changes among the study subjects is shown in Table II. The most commonly affected facial areas were the cheeks. The distribution of skin changes in different facial areas is shown in Fig. 1. Sixty-one of the 78 rosacea patients (78%; 95% CI 67–87%) had ETR and 17 (22%; 95% CI 13–33%) had PPR; only one person also had mild rhinophyma, in addition to moderate ETR, and this 46-year-old male subject was also included in the ETR subgroup. The majority of subjects with rosacea had mild erythema and/or telangiectasia and 0–5 papules/pustules on one side of the face (Table II). Fifty-two of the 348 study subjects (15%; 95% CI 11–19%) experienced frequent episodes of flushing without permanent features of rosacea, and these subjects were defined as flushers.

The prevalence rate of rosacea in the age group 30–39 years was 16%, and in the older groups 27.5% (40–49 years) and 26% (≥ 50 years) ($p < 0.05$). Flushing episo-

Table I. Main characteristics of the study population ($n = 348$)

Variable	No.	Rosacea, n (%)	Flushing, n (%)
Age ^a , years			
30–39	143	23 (16)	32 (22)
40–49	109	30 (28)	13 (12)
50–59	66	20 (30)	5 (8)
60+	30	5 (17)	2 (7)
Gender			
Male	128	31 (24)	13 (10)
Female	220	47 (21)	39 (18)
Fitzpatrick skin types			
I	9	5 (56)	0
II	136	34 (25)	29 (21)
III	178	32 (18)	22 (12)
IV	25	7 (28)	1 (4)

^aAge groups 50–59 and 60+ years are considered as one subgroup, ≥ 50 years in Fig. 2 and in the statistical analysis.

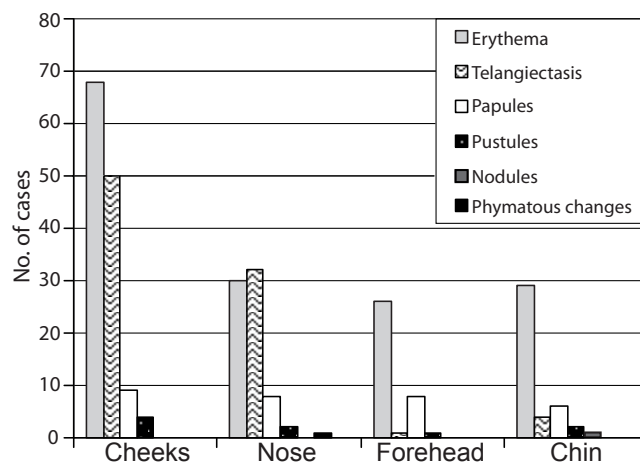


Fig. 1. Distribution of skin lesions in different facial areas among subjects with persistent symptoms of rosacea ($n = 78$).

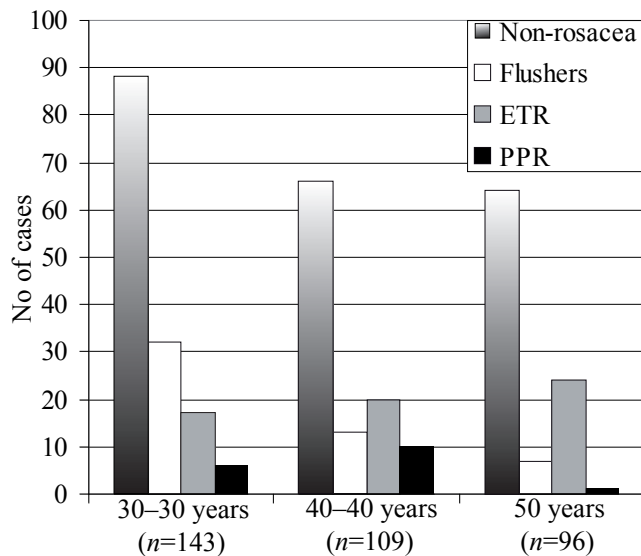


Fig. 2. Age distribution of subjects with or without rosacea-like skin features ($n=348$). ETR: erythematotelangiectatic rosacea; PPR: papulopustular rosacea.

des without permanent symptoms of rosacea were more prevalent in the 30–39-year-old age group compared with the older age groups. There were no age-specific differences among persons without rosacea and without frequent episodes of flushing. The age distribution of subjects without rosacea, flushers, and subjects with different rosacea subtypes is shown in Fig. 2. No statistically significant gender-related differences were found between these study groups.

Subjects with photosensitive skin types experienced flushing episodes and ETR more frequently than did subjects with non-photosensitive skin types, while in the non-rosacea group skin types III and IV dominated. There were no differences in terms of skin type among the patients in the PPR group according to Fitzpatrick (Fig. 3).

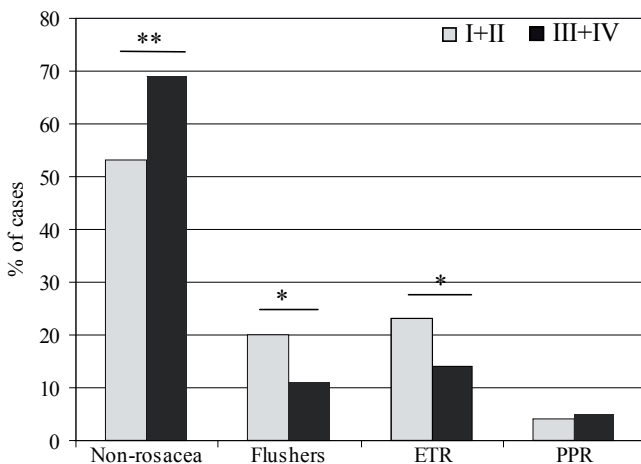


Fig. 3. Skin phototype distribution in subjects without rosacea and in those with different rosacea subtypes ($n=348$). Fitzpatrick's phototype classification (I–IV) was used. * $p < 0.05$, ** $p < 0.005$. ETR: erythematotelangiectatic rosacea; PPR: papulopustular rosacea.

Fifty-three of the 78 rosacea patients (68%) had noticed their skin changes; 3 females and one male out of the 348 study subjects (1%; 95% CI 0.3–3%) had consulted a doctor due to their rosacea. There were no statistical differences in self-detection of skin changes in relation to the patients' gender, education, skin type, subtype or severity of skin changes. There were also no significant differences in self-detection in relation to the number of papules

DISCUSSION

This study investigated the prevalence of rosacea in a randomly selected working population, aged ≥ 30 years, using NRSEC criteria (3). The overall prevalence rate of rosacea symptoms was 22%, which is significantly higher than found in previous studies addressing the same issue. In similar studies conducted in Sweden (5) and Germany (4) the prevalence rate of rosacea in the general working population was 10% and 2%, respectively. In 1989, Berg & Lidén (5) defined the "rosacea group" as individuals with papules and/or pustules, erythema, telangiectasia and swelling, or an anamnesis of rosacea within the past 2 years; they reported that, apart from the rosacea group, 55% of the remaining study population also had telangiectasia, which is one of the primary signs of rosacea and should be classified as ETR according to the NRSEC classification (3). Schaefer et al. (4) did not specify the criteria used for diagnosing rosacea, but that study was started before the establishment of the NRSEC classification in 2002 (3). However, in a report published in a news magazine in 2006, the prevalence rate of rosacea according to the NRSEC criteria was 20.5% among a Caucasian female population aged 8–70 years in London and Los Angeles (11), which is similar to our results. It has been noted that the prevalence rate depends on the classification used by the researcher (5). It has been suggested that the NRSEC classification is too permissive, and that the presence of papules and pustules, at least, is required for the diagnosis of rosacea, and in the absence of papules and pustules, actinic erythema and/or actinic telangiectasia would be better referring diagnoses (12). The use of different diagnostic criteria of rosacea might explain discrepancies in the results of different studies.

The prevalence rate of ETR was three times higher than that of PPR, and phymatous changes were very rare. Similar proportions of rosacea subtypes have also been reported previously (5, 7, 11).

There is widespread opinion that the prevalence of rosacea peaks between the ages of 40 and 60 years (9). We found that the prevalence rate of rosacea was significantly higher after the age of 40 years. The prevalence of PPR was higher in the fourth decade of life and remained lower in later decades (Fig. 2.). Fifteen percent of study subjects experienced frequent episodes

of flushing without permanent features of rosacea. As the data were based mainly on the subjects' reports and as there are many other causes of flushing besides rosacea, e.g. fever, medication, menopause, malignancies, anaphylaxis, etc. (13), those persons were not included in the rosacea group. In the current study it was found that subjects with photosensitive skin types experienced both flushing episodes and ETR more frequently. The prevalence of flushing episodes without permanent rosacea signs decreased in the older age groups, giving way to ETR, whose prevalence increased with age, in contrast to flushing. This suggests that the transition from flushing episodes to ETR is related to the (photo) ageing process. Further prospective cohort studies are needed to confirm this association.

According to the NRSEC classification, the clinical score-card of rosacea depends on the severity of primary and secondary features. Assessing the severity of ETR, we considered the presence of mild, moderate or severe erythema and telangiectasia. For scoring PPR, the NRSEC suggests counting papules and pustules as few, several or many. Like some other authors (14), we are of the opinion that, for a better understanding, the number of lesions should be taken into account. For the sake of clarity, the relevant part of the classification requires further discussion among experts.

Both genders were equally affected with rosacea, although there was a slight predominance of PPR in the men, while the women reported experiencing flushing episodes slightly more often. Although some authors have found that both genders are equally affected (4, 7), rosacea is principally known as a disease with female predominance (1, 5, 9). A possible explanation for this is the fact that women seek care for rosacea more often than men (15). There were more female than male subjects in the present study. According to the Estonian census of 2000, 45% of the 30–69-year-old working population of Tartu (total $n=30,533$) were men and 55% were women. The participation rate in the study did not differ between genders in institutions in which the examinations were performed, but many institutions in our study had predominantly female employees. The study was conducted mainly in working offices; and it may be that a relatively higher proportion of women than men are office employees, while predominately men work outdoors.

Although the proportions of the subtypes and genders were similar to those in earlier studies, the prevalence rate of rosacea according to the NRSEC criteria was very high. However, approximately one-third of subjects had not noticed their skin changes and only a few of them had attended a doctor. This raises the question as to whether rosacea is more common than previously expected, or whether the diagnostic criteria are too flexible. On the other hand, it has been suggested previously that the subjective perception of disease is an indepen-

dent reason for rosacea patients to seek healthcare and is not always related to the severity of the disease (16); some patients may react with subjective skin symptoms even without having any visible skin signs (17).

The current study has a number of strengths. To the best of our knowledge this is the first study of the prevalence rate of rosacea that directly and strictly follows the NRSEC criteria in both genders. As all evaluations were performed by one and the same dermatologist, the results did not depend on the evaluations of different researchers. The study subjects represent a randomly selected working population. The employment rate among women in Estonia is very high, and the study population is similar to the general population with respect to gender distribution.

There are also some limitations to the study. It investigated only those employees aged ≥ 30 years. It did not investigate people working at home, housewives, students, pensioners, unemployed people, disabled people, or those people who were not working for other reasons. However, the rate of registered unemployment for the years 2005 to 2007 was very low (4.3%, 2.4% and 2.1%, respectively) at the time of the study (18).

In conclusion, according to the NRSEC criteria, rosacea is a more common skin condition after the age of 30 years than previously thought. One-third of subjects who have rosacea according to the diagnostic criteria do not notice their skin changes.

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The authors declare no conflict of interests.

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