Turkish Journal of Geriatrics
2015;18(1):42-46

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Received: 03/11/2014

Accepted: 08/12/2014

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RESEARCH

AN ASSESSMENT OF OLFACTORY FUNCTION IN AN ELDERLY POPULATION

ABSTRACT

Introduction: It is estimated that the prevalence of olfactory dysfunction in the general population varies from 3% to 8%. However, in elderly populations, particularly in those older than 65 years of age, the prevalence exceeds 60%. In this study, we compared the olfactory function of an elderly population with young healthy individuals using the Sniffin' Sticks smell identification test.

Materials and Method: All subjects had presented to the Kayseri Training and Research Hospital between May 2013 and May 2014. One-hundred and seven patients older than 60 years of age were included in one group, while twenty one healthy volunteers younger than 60 years of age were included in the second group. Twelve odours were tested in all subjects using Sniffin' Sticks Test. Answers were recorded and calculated as Sniffin' Sticks Test score, which was used to classify patients as follows: 10–12 points, normosmic; 7–9 points, hyposmic; and 0–6 points, anosmic.

Results: The average elderly population Sniffin' Sticks test score (7.97±2.2) was significantly lower than that of the young healthy population (10.86±1.06) (p<0.001). In the elderly population, 14% were classified as normosmic, 71% were hyposmic and 15% were anosmic. Furthermore, there was no significant difference in total smell score between genders (p=0.799).

Conclusion: It was found that Sniffin' Sticks Test score were significantly lower in an elderly population when compared to a young population. Further comprehensive studies evaluating additional parameters such as odour threshold and perception are needed in elderly population.

Key Words: Smell; Identification; Geriatrics.

ARAŞTIRMA

YAŞLI POPULASYONDA KOKU FONKSİYONUNUN DEĞERLENDİRİLMESİ

ÖZ

Giriş: Olfaktör fonksiyon bozukluğu toplumda %3-8 oranında tahmin edilmektedir, ama yaşın ilerlemesi ile birlikte özellikle 65 yaş sonrası toplumun %60'dan fazlası bu durumdan etkilenir. Bu çalışmada, yaşlılarla birlikte sağlıklı genç bireylerin koku fonksiyonları Sniffin Sticks Koku Tanımlama Testi kullanılarak karşılaştırıldı.

Gereç ve Yöntem: 2013 Mayıs-2014 Mayıs ayları arasında Kayseri Eğitim Araştırma Hastanesine gelen 60 yaş ve üzeri 107 hasta 1. gruba, 21 hastadan oluşan sağlıklı 60 yaş altı gönüllüler 2. gruba alındı. Bütün bireylerde Sniffin Sticks Testi kullanılarak 12 koku değerlendirildi. Verilen cevaplar kayıt altına alınıp 12 üzerinden Sniffin Sticks Testi skoru hesaplanarak hastalar 3 gruba ayrıldı; 10-12 puan normozmik, 7-9 puan hipozmik ve 0-6 puan alanlar anozmik.

Bulgular: Yaşlı grubun Sniffin Sticks Testi değeri 7,97±2,2, sağlıklı genç gönüllülerde ise Sniffin Sticks Testi skoru 10,86±1,06 olup istatistiksel olarak fark anlamlıydı (p<0,001). Yaşlı populasyonda normozmik olanlar %14, hipozmik olanlar %71 ve anozmik olanlar %15 idi. Buna ilaveten, total koku skoru açısından cinsiyet bakımından istatistiksel olarak anlamlı fark yoktu (p=0,799).

Sonuç: 60 yaş üzeri yaşlı populasyonda istatistiksel olarak genç populasyona göre Sniffin Sticks Testi skorunun düşük olduğu saptandı. Yaşlı populasyonda koku eşiği ve koku algısı gibi ek parametrelerinde bakıldığı daha kapsamlı çalışmaların yapılmasına ihtiyaç vardır.

Anahtar Sözcükler: Koku, Tanımlama; Geriatri.

Introduction

Olfaction has an important role in the quality of life (1) and it allows us to recognise environmental hazards such as fire, decomposed foods and gas leaks. It is estimated that the prevalence of olfactory dysfunction varies from 3% to 8% in the general population. However, in elderly populations, particularly in those older than 65 years of age, the prevalence exceeds 60% (2-4). It is important to make the discrimination between physiological (presbiosmia) and unexplained olfactory dysfunction (5). A recent study has demonstrated that a small percentage of olfactory dysfunction in the elderly is due to presbiosmia. Olfactory dysfunction can be due to damage to the olfactory epithelium caused by trauma, toxins or drugs (6). Standardised tests such as Sniffin' sticks, which are widely accepted and compatible with community sociocultural structures, are needed to assess olfactory function in elderly populations.

In this study we aimed to compare the Sniffin' sticks smell identification results obtained from an elderly Turkish population with those obtained from healthy young individuals.

Materials and Method

Patient Selection

The study was approved by the Ethics Committee of Erciyes University (Approval#2013/382). From patients presenting to the Kayseri Training and Research Hospital between May 2013 and May 2014, 107 older than 60 years of age were included in the first group, while 21 healthy volunteers younger than 60 years of age were included in the second group. All patients underwent a rhinological examination at the ENT and Head & Neck Surgery Clinic of Kayseri Teaching Hospital. Subjects with prominent septal deviation, allergic rhinitis, nasal polyposis or rhinosinusitis were excluded. In addition, subjects with diabetes mellitus, smokers, those with neurological deficits and those receiving drugs, which could affect olfaction, such as ACE inhibitors, Calcium canal blockers, statins, diuretics or antidepressants were also excluded.

Assessment of Olfactory Function

Smell test sticks were used within six months of the production date, in accordance with the manufacturer's instructions. Smell identification tests were performed in a well-ventilated room by the same operator who was instructed not to use perfume or powdered gloves. Twelve odours were tested by holding Sniffin' sticks 2 cm from the right and left nostrils for 3 seconds with 30second intervals. After sniffing each odour the subjects were asked to complete a four item questionnaire. The answers allowed a Sniffin' Sticks Test (SST) score to be calculated. The subjects were classified according to their SST scores as follows: 10-12 points, normosmic; 7-9 points hyposmic; and 0–6 points anosmic. In addition, subjects were further classified into three groups according to a subjective rating of olfactory function (good, fair and poor) that was estimated by using a percentile scale and SST scores.

Statistical Analysis

All statistical analyses were performed using SPSS for Windows Version 16.0. Smell scores were compared between groups using the Student's *t*-test. Nominal values were compared by using the X^2 test. $p<0.05$ was considered as statistically significant.

Results

One-hundred and seven patients (55 men and 52 women) comprised the first group (elderly patients), while21 subjects (15 men and 6 women) comprised the second group (young healthy subjects). There was no significant difference between groups regarding gender (p=0.101). The mean age was 68.3±5.6 years in the first group and 36.9±7.4 years in the second group (significance, p<0.001).

The average SST score was significantly lower in the elderly group (7.97±2.2) than in the young healthy group (10.86±1.06) (p<0.001). In the elderly population, the SST score was 7.93±2.21 in males and 8.04±2.28 in females. There was no significant difference in SST between genders (p=0.799).

Regarding the elderly population, 14% were classified as normosmic, 71% were hyposmic and 15% were anosmic. There was no significant difference in gender among normosmic, hyposmic and anosmic patients (p=0.772). Regarding the young healthy group, 85.7% were normosmic and 14.3% were hyposmic. No anosmic individual was recorded. There was a significant difference between the groups regarding the frequency of normosmia, anosmia and hyposmia (p<0.001). In the elderly population, olfactory function was classified as poor in 84.1%, fair in 14% and good in 1.9% of patients (Table 1). In the second group, it was classified as poor in 28.6%, fair in 33.3% and good in 38.1% of subjects. There was a significant difference between groups regarding olfactory function (p<0.001). An assessment according to gender revealed that there was no significant difference in olfactory

Table 2— Comparison of Percentage and Mean Values Between Groups Regarding Gender, SST Score, Subjective Odour Classification, Hyposmia and Anosmia.

	Group 1	Group 2	p
Age	68.3±5.6	36.9±7.4	0.001
Female	52	6	0.001
Male	55	15	0.001
SST score	7.97±2.2	10.86±1.06	0.001
Hyposmic (%)	71	14.3	0.001
Anosmic (%)	15	0	0.001
Normosmic (%)	14	85.7	0.001
Good (%)	1.9	38.1	0.001
Fair (%)	14	33.3	0.001
Poor (%)	84.1	28.6	0.001

function between genders in the elderly population (p=0.863).

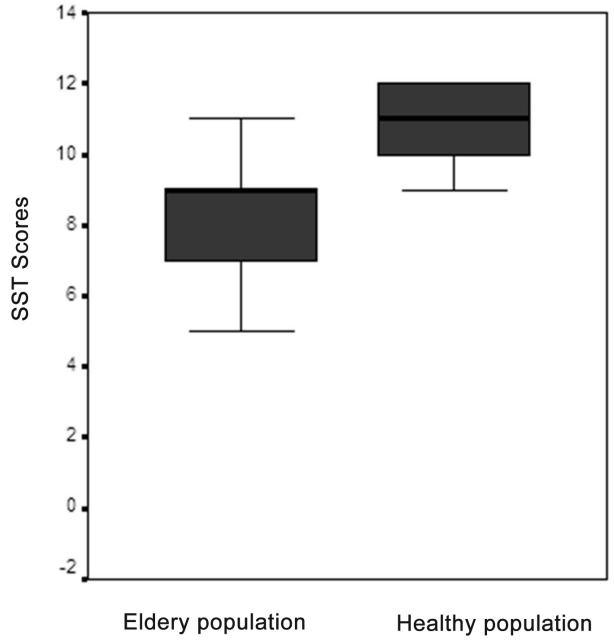

Figure 1— Comparison of Sniffin' Sticks Test (SST) scores.

Discussion

Many studies have shown that olfactory sensitivity decreases with advancing age (7-11). Conditions where hearing and vision become physiologically blunted, such as presbycusis or myopia, are common in the elderly population. Similarly, presbiosmia, where olfaction is physiologically decreased, has also been reported to be common in this population (5). Age-related olfactory disorders may be associated with neural and cortical pathways, physiological alterations such as memory deficits, a decreased blood flow of olfactory epithelium, increased mucus viscosity or decreased metabolic activity (8). Furthermore, it is known that there is a decrease in olfaction associated with decreased mental and cognitive function, such as in Alzheimer's and Parkinson's diseases. In a large epidemiological study from the USA (n=2491), it was reported that olfactory function was reduced by 24.5% in the elderly population (12). In a study that investigated the relationship between malnutrition and olfactory function in 191 geriatric patients by using SST scores, hyposmia was found in 39.3% and anosmia in 31.9% of subjects (13).

Here, we found hyposomia in 71% and anosmia in 15% of the elderly population. This data contrasts with the young healthy group where 14% were found to be hyposmic and 86% were found to be normoosmic, with no anosmic individual detected. Between groups there was a significant difference in SST scores (p<0.001). Compared to our study, the study of Smoliner et al. (13) used older subjects (79.6±6.3 compared to68.3±5.6 years), as well as some patients with malnutrition. Although no correlation was detected between olfaction and nutritional status in that study, the percentage of anosmic patients was higher than described here. The smell identification test is produced in Germany in accordance with the sociocultural status and lifestyle of that region. Moreover, it has also been reported that environmental and climatic conditions may affect olfaction (8,14,15). We suspect that the differences between these two studies are not related to climate, as there is little climatic variation between Turkey and Central Europe. Interestingly, our elderly population experienced difficulty in defining liquorice and pineapple odours. In Turkey, tropical fruits aren't commonly consumed due to socioeconomic reasons and this may therefore effect the SST results. It has also been reported in a German study that cultural and geographic factors may play a role in the divergence from local normative values of olfaction (6). In our study, the number of hyposmic patients was found to be higher than in the German study, while the number of anosmic patients was lower.

The effects of hormones on olfactory function haven't been fully elucidated (16,18). In a study by Katotomichelakis et al. (2008), it was found that the olfactory threshold and smell

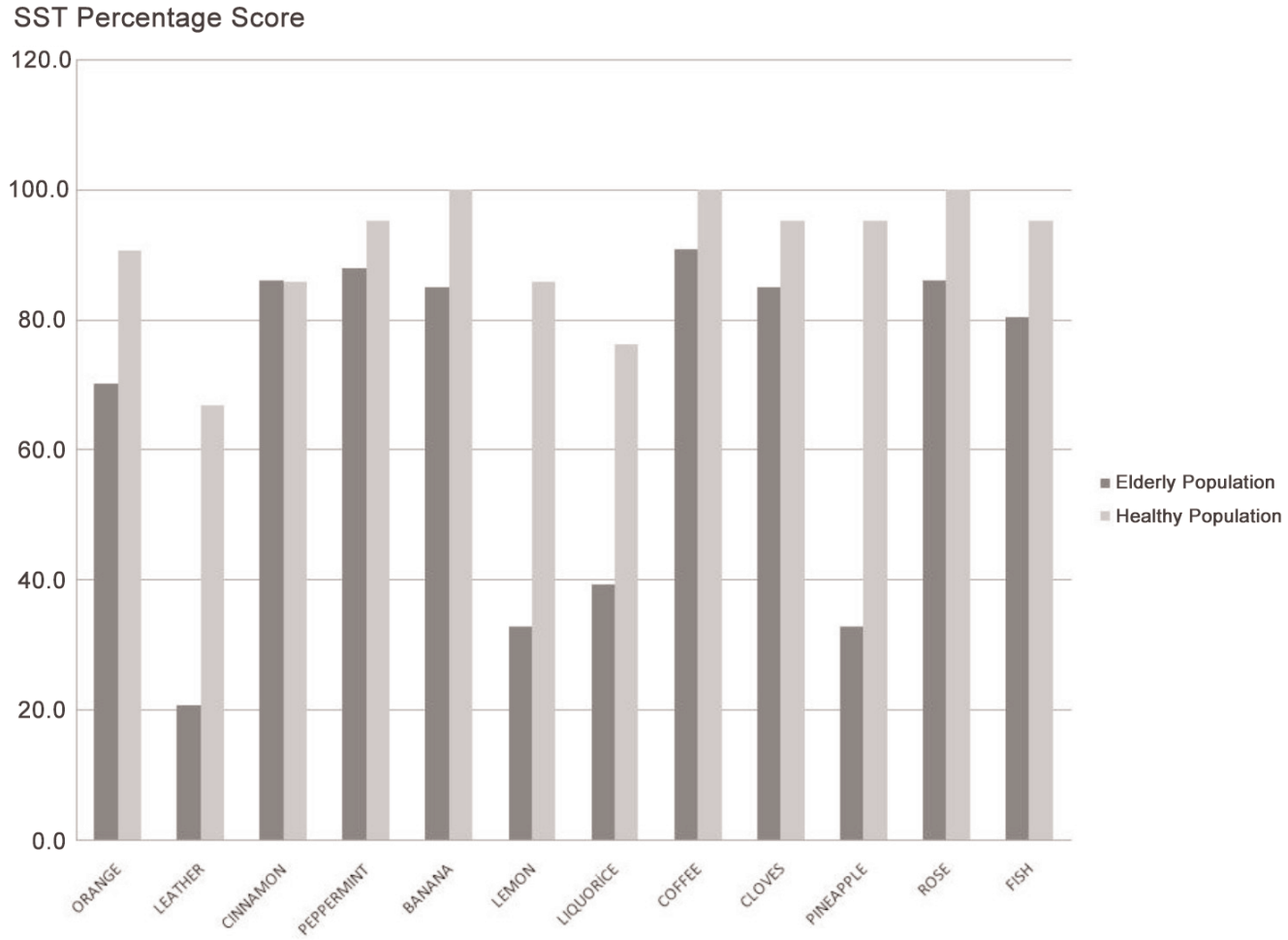

Figure 2— Sniffin' Sticks Test (SST); percentage of correct answers in smell identification are given separately.

identification scores were markedly higher in women when compared to men. The positive effects of hormones on olfactory epithelium were linked largely to oestrogen. In addition, Dhong et al. reported that oestrogen had a protective effect on rats in which experimental olfactory dysfunction was induced (19). This may be associated with the regulatory effect of oestrogen on the secretory activity of mucosal membranes. However, in a study of 3000 cases by Hummel et al., no difference was found in smell identification scores between genders (20), and Smoliner et al. found that there was no significant difference in smell identification scores between men and women. Nevertheless, in several additional studies it has been reported that olfactory function is lower in men when compared to women (3, 21). In a study by Schubert et al., it was reported that the reduction in olfactory function was 2-fold higher in men compared to women. In our study, there was no significant difference in SST scores between men and women in the elderly population (p=0.799). In addition, there was no significant difference between men and women regarding olfactory function classified as good, fair or poor (p=0.863). Furthermore, no significant difference was found between elderly men and women regarding hyposmia, anosmia or normosmia (p=0.772). Presumably, the decrease in oestrogen secretion in postmenopausal women abolishes their gender superiority regarding smell identification testing. There is a need for further studies involving oestrogen levels and their effects on olfactory function.

In conclusion, in a Turkish geriatric population, it was found that odour perception was significantly lower when compared to a young healthy population. We found that there was

anosmia in 15% and hyposmia in 71% of the elderly population. In contrast, an elderly population from Germany displayed rates of hyposmia and anosmia of 39.3% and 31.9%, respectively. This difference may be due to variations in climate and lifestyle. We conclude that olfactory test batteries should be prepared considering the sociocultural conditions of specific countries. Further comprehensive studies evaluating odour thresholds and other parameters of odour, as well as odour perception in geriatric populations, are needed.

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