Jordan smell test: a pilot study

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Objective
An objective smell test is essential to identify the level of smelling sensation and provide information on changes in olfaction after treatment. The aim of this study is to describe a simple, portable, inexpensive, and reliable olfaction identification test in the Arab population (Jordan smell test).

Patients and methods
Seven odorants that are familiar to Arab people were selected for this smell test. In academic tertiary medical center setting, odor discrimination testing in patients with sinonasal disease and in nonsmoker healthy volunteers was performed, and the results were compared with appropriate statistical formulas.

Results
A total of 25 healthy volunteers and another 25 age-matched and sex-matched patients with sinonasal pathology were evaluated with our smell test. Volunteers scored 13.2 in Jordan smell test, whereas the score was 9.2 in the patients ($P < 0.0001$). For each tested odor, there was a significant difference between both groups. Volunteers scored least for the tobacco smell, and patients scored highest for coffee.

Conclusion
Jordan smell test is a novel, office-based, and easy administrable method to objectively assess olfaction sensation in the Arab population. The test is flexible to changes in its different variables, such as the type or number of odors. Further studies with a larger number of participants in different Arab countries are needed to validate our results.

Keywords:
sinus, odor, olfaction, sensation, smell

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Introduction

The sense of smell has an essential role in our daily life; it helps in flavor detection and dangerous signal identifications. It also provides information on memory and linguistic processing [1]. Abnormality in smell sensation is commonly encountered in rhinology clinics and can lead to significant impairment of quality of life, taste disturbance, and loss of pleasure from eating, with resulting weight changes [2].

Loss of smell has been linked to inadequate nutritional intake, reduced social pleasure, and decreased psychological health [2,3]. Although smell sensation may be less vital to human's well-being and functionality than vision and hearing, it may still be life threatening, by impairing the detection of smoke in a fire or the ability to identify spoiled food [4].

The incidence of smell impairment appears to be increasing owing to industrial accidents, pollution, allergic rhinitis, and an aging population [5,6]. The prevalence of disorders of taste and smell in the US general population has been estimated by the US National Health and Nutrition Examination Survey (NHANES) 2011–2014 protocol [7]. A total of 3519 men and women aged older than 40 were tested with a scratch-and-sniff olfactory test. The estimated prevalence was 13.5% for smell impairment, 17.3% for taste impairment, and 2.2% for taste and smell impairment [7].

Qualitative analysis of smell impairment is important in clinical practice, especially before any medical or surgical treatments are considered. Objective smell tests not only identify smell ability but also provide information regarding posttherapeutic outcome. As an example, it is often difficult to predict the margin of improvement of the patients' sense of smell after functional endoscopic sinus surgery, though it is a common concern for patients before the procedure.

A variety of smell tests are available worldwide; the most famous are the University of Pennsylvania Smell Identification Test (UPSIT), the Connecticut Chemosensory Clinical Research Center identification test in the USA, and the Sniffin' sticks test in Europe. However, there are currently no globally accepted

golden standard smell tests. One reason for the lack of an international standard smell test is that odor identification is related to familiarity of aromatic items, which differs from nation to nation [6,7].

These tests are expensive and not available in all Arab otolaryngology centers. Additionally, Arab people may not always know the name of a strange odor even if they can smell it adequately. The aim of this study was to describe a simple, portable, inexpensive, and reliable olfaction identification test in the Arabic population (Jordan smell test) and compare the results of the test between healthy volunteers and individuals with sinonasal pathology. We hope the test will provide otolaryngologists in our region with a convenient and easy method to evaluate the strength of the individuals' sense of smell.

Patients and methods

After obtaining the approval of our hospital's research and human ethics committee, informed consents were obtained from 25 nonsmoking healthy adult volunteers not known to have any diseases or on medications that could affect olfactory function (group 1) and were also obtained from another 25 patients who visited our clinic with sinonasal symptoms (group 2). Patients who were excluded were those younger than 16 years, pregnant or lactating, have had previous sinonasal surgery, and those with a difficulty to communicate.

A trained investigator performed the interview, where the purpose of the study and its contents were explained to all participants. All participants were asked to evaluate their smell power in a 10-cm visual analog scale (VAS) (0 = bad – weak smell power, and 10 = strong smell power). They were also requested to describe their smell ability as absent, poor, good, and perfect.

All patients underwent complete sinonasal examination, and any abnormal findings were reported, including nasal septum deviation, turbinate hypertrophy, status of mucosa, presence of polyps, and postnasal space condition. Endoscopic examination and proper radiological evaluation were performed as guided by history and physical examination.

Covered containers filled with seven selected well familial odorant to Arabic population (tea, garlic, cinnamon, cacao, coffee, sage, and tobacco) and one container filled with 70% alcohol (control) were introduced to participants around 1.5 cm below the nostrils. Participants were asked to sniff without force. For each correct odorant name detection, a score of 2 was yielded, if the participant was able to detect the odorant but was unsure of its nature (detectable but not recognizable) one point was given, and a zero score if the applicant cannot smell at all; thus, the minimum score for the test is zero and the maximum is 14.

Parametric data were analyzed using the unpaired *t*-test. Nonparametric data were analyzed using the Mann–Whitney *U* test. Categorical data were analyzed by the χ^2 test and Pearson correlation coefficient were used for the statistical analysis. A *P* value of less than 0.05 was considered significant.

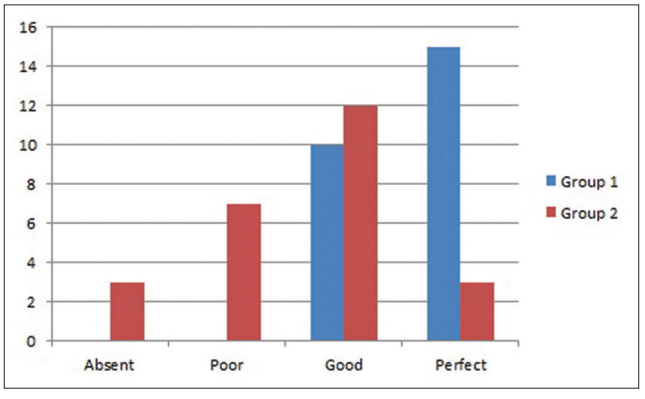
Results

A total of 50 participants completed the study. Age and sex were comparable between the two groups (Table 1). The diagnoses in the patient group were chronic rhinosinusitis in 12 (48%) patients, inferior turbinate hypertrophy in seven (28%) patients, nasal septum deviation in four (16%) patients, and allergic rhinitis in two (8%) patients. The average VAS in the control group was 9 and 5.9 in the case group; this difference was statistically significant ($P \leq 0.0001$). Volunteers scored 13.2 in Jordan smell test, whereas the score was 9.2 in the patients; this difference was also statistically significant ($P \leq 0.0001$). Statistically significant positive correlations were found in both groups between VAS and Jordan smell test Score, as well as self-smell description and Jordan smell test score (Table 1).

Table 2 shows the average score comparison between both groups for each studied odors. Volunteers scored least for the tobacco smell, whereas patients scored highest for coffee. Statistically significant differences between the two groups in all studied odorants were noticed (Table 2). There was no significant difference in alcohol sensation between both groups.

Fig. 1 demonstrates the distribution of participants in this study based on their self-description of olfaction

Figure 1



Self-description of olfaction sensation status in both groups.

Table 1 Comparison between both groups in demographic data, test score, and correlation between variables

	Group 1 volunteers (*n*=25)	Group 2 patients (*n*=25)	*P*
Age	Average: 32	Average: 37	0.2
	SD: 14	SD: 12	
Sex			
Female : male	13 : 12	10 : 15	0.4
VAS	Average: 9	Average: 5.9	
	SD: 1.1	SD: 2.8	0.0001
Jordan smell test score	Average: 13.2	Average: 9.2	
	SD: 0.7	SD: 3.2	0.0001
Correlation between VAS and Jordan smell test score	0.32	0.71	0.0001
	P=0.03	*P*=0.001	
Correlation between patients' self-smell description and Jordan smell test score	0.16	0.66	0.0001
	P=0.04	*P*=0.001	

VAS, visual analog scale.

Table 2 Score comparison between both groups for each tested odors

Odor	Group 1 volunteers (score)	Group 2 patients (score)	*P*
Tobacco	1.44	1.04	0.02
Tea	1.8	0.9	0.0001
Coffee	2	1.64	0.009
Alcohol	2	1.8	0.05
Sage	1.92	1.04	0.0001
Cinnamon	2	1.28	0.0001
Cocoa	2	1	0.0001
Garlic	2	1.5	0.001

sensation status, and again a statistically significant difference was found ($P \leq 0.0001$) between both groups.

Discussion

An effective olfaction test should have an objective score for familiar odors' detection relevant to cultural setup. Different studies have been published modifying the well-established smell tests to fit the need of their nation [6,8–11]. This case–control pilot study was conducted to create a reliable test to assess the sense of smell in the Arab population, as there is no established measure to evaluate this chemosensation fundamental function in our region. The substances were selected from our local dietary and cultural habits. They were chosen based on their properties, familiarity, and practicality. We found that the Jordanian smell test can objectively score the power of smell sensation using a simple, easy, and inexpensive technique.

Loss of smell has been linked to inadequate nutritional intake, reduced social pleasure, and decreased psychological well-being. It is now well recognized that a number of the elderly with olfaction impairment have direct consequences on their health and safety [7]. Even after controlling for age and other confounders, one longitudinal study of 1162 nondemented older persons found the mortality rate over a 4-year period was 45% for those with lowest baseline olfactory test scores, when compared with a rate of 18% in those with the highest test scores [12].

In rhinology clinics, objective evaluation of patients' olfactory function is essential for the diagnosis and treatment of smell disorders. Validity and reliability of results are of vital importance for both clinical and research assessment. However, practical worries such as simplicity and brevity of administration, cost, and patient preference must be weighed against the available resources and testing needs of the test center [13].

Many studies found that as the age progresses, the olfactory sense ability decreased [14,15]. The possible justifications given for this decrease are psychologic factors such as age-related deterioration in memory or attention and various histological and physiological changes in the elderly sinonasal mucosa such as changes of epithelial blood flow, reduced metabolism, or increased mucus viscosity [14]. Our patients were matched with the control group in age; thus, this factor was unlikely to affect our results.

Sex is another factor that can affect human olfaction ability, where females are more sensitive than males [14,15]. The reason for this difference is believed to be owing to estrogen effect on olfactory tissue. In our study, there was no statistical difference between both groups regarding sex distribution. Other possible etiological factors are low socioeconomic status, low education attainment, asthma, and smoking, but they are still not proven to have direct definite correlation with smell impairment [7].

Perception of smell is frequently disturbed in sinonasal disease [16,17]. In our study, the range of Jordanian smell test for the sinonasal disease patients was 0–13, with mean of 9.2, and the range of score for normal

control was 12–14, with mean of 13.2, thereby establishing that there was considerable difference in the olfactory scores between the two groups. Our result is consistent with previous studies conducted in different ethnic groups [1,7–11].

Oleszkiewicz and colleagues were first to describe an Arabic smell test in 2016 by modifying the original Sniffin' sticks test. After several trials of choosing odors close to the Arab culture, they evaluated the modified version on 13 patients with olfactory disorders. They found the Arab version of the test had high reliability. Our aim was to establish a less time-consuming and easy administrable test. Jordan smell test may be used as a screening evaluation, especially in the outpatient department. If more detailed information is needed, the more thorough aforementioned test may be tried [18].

Conclusion

In conclusion, Jordan smell test is a simple, cheap, and portable method to objectively assess olfaction sensation. The modified test fits the Arab population. The test could effectively differentiate between olfactory function in patients and normal individuals. The Jordanian smell test is flexible to changes in its different variables, such as the type or number of odors. Further studies with larger number of participants and with different sinonasal disorders in different Arab countries are needed to validate our results.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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