A Study on Olfactory Dysfunction in Turkish Population with using Survey Method and Validated Olfactory Testing

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Received: 29 January 2014 / Accepted: 28 March 2014 / Published online: 8 April 2014
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Abstract The aim of this study was to evaluate the effect of olfactory dysfunction on quality of life (QOL), and to investigate olfactory dysfunction related self-reported clinical features in Turkish population. The participants were questioned about the presence of any olfactory dysfunction. Participants with a complaint of olfactory dysfunction were asked to fill out a survey and then a validated olfactory test was performed. We asked 2,824 volunteers whether they had olfactory dysfunctions or not. A total of 199 (6.7 %) people mentioned that they had, and filled out the questions in our survey. The mean age of the surveyed population was 44 ± 15 years. The current investigation produced four major findings (1) the feeling of inadequacy due to olfactory dysfunction was more common among females than males

(2) there was a significant correlation between subjective olfactory complaints and objective olfactory testing (3) problems in QOL issues are typically reported primarily in the areas of safety and nutrition (4) the possible reasons for the olfactory dysfunction according to the volunteers were upper respiratory infections including rhinosinusitis (46 %), allergic rhinitis (27 %), severe face and head trauma (6.5 %). The effect of subjective olfactory dysfunctions on QOL among the Turkish population was investigated for the first time. Problems in daily life issues are typically reported primarily in the areas of safety and nutrition.

Keywords Olfactory dysfunction · Etiology · Health survey · Quality of life

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Introduction

The sense of smell is a chemical stimulus and part of the system of sensation perceived by human and all other livings. In contrast to some animals in nature that are vitally dependent on their sense of smell, humans may survive without it. Although the significance of olfaction in human daily life is often underestimated, it has important roles, for example, by warning us against and attracting us towards odorous items, influencing food intake, and affecting interpersonal relations [1–4].

Olfactory dysfunction needs to be objectively diagnosed and managed by clinicians, but it is also important to know the prevalence of self-reported olfactory dysfunction which may determine whether they are likely to seek medical attention. Several studies, performed in different countries, showed that approximately 5 % of the general population is anosmic and about 15 % have reduced olfactory function [5–9].

As a further step to understand and treat the olfactory dysfunction in our country, this study was aimed to investigate the effects of olfactory dysfunction on quality of life and its related self-reported clinical features in Turkish population.

Materials and Methods

This study was approved by the Institutional Review Board of GATA Haydarpaşa Training Hospital. Informed consent was obtained from all participating subjects.

Participants admitted to GATA Ankara and Haydarpaşa Training Hospitals, and Istanbul Surgery Hospital with different reasons were questioned about the presence of any olfactory dysfunction. Participants with a complaint of olfactory dysfunction were asked to fill out a survey prepared in order to determine the etiology, clinical properties and daily life effects of this disorder.

Of the 22 questions on the survey, three questions were regarding demography; gender, age and current educational level.

The 4th question examined how the participants defined their olfactory dysfunction (anosmia; a complete loss of smell, hyposmia; diminished olfactory sensitivity, intermittent hyposmia; intermittent diminished olfactory sensitivity, parosmia; patients finding sensations to be unpleasant, phantosmia; having olfactory perception when no odour is present) [10]. The 5th question was about the onset of the olfactory dysfunction (sudden onset, gradual onset or do not know) and the 6th question was on the progression of the dysfunction (no change, getting better, getting worse, variable). There were two questions regarding the etiology of the olfactory dysfunction; the 7th question was about the patients' opinion concerning the olfactory dysfunction (infections of the upper respiratory tract, sino-nasal disease (acute or chronic rhinosinusitis, nasal polypsis e.g.), allergic rhinitis, menstrual cycle) and the 8th question asked about any severe face and/or head trauma (yes, no). Two questions were about any exposure to toxic or noxious substances: the 9th question was regarding exposure to dust, gases, fumes, vapours or/and volatile toxics at home and/or at work, if any (yes, no), and the 10th question was on smoking habits (non smoker, smoker). The 11th question was regarding any other symptoms accompanying the olfactory dysfunction (halitosis, loss of taste, xerostomia, nasal stuffiness, runny nose, sneeze, postnasal drip, head ache, facial pain/pressure, snoring, nasal dryness, hair loss, sexual aversion, emotional distress, and menstrual cycle irregularity). These 11 questions aimed to investigate the etiology of the olfactory dysfunction and related situations, and the next 11 questions aimed to create an understanding of the effects of olfactory dysfunction on the life-qualities of the

volunteers (Table 1). These 11 questions were prepared in keeping with surveys on life-quality evaluation [4, 11, 12]. The answers to these questions were “always, almost always, sometimes, almost never, and never”.

Also, the validated “Sniffin’ Sticks” olfactory test was performed in order to determine the olfactory abilities of surveyed participants [13, 14]. Odorants were presented using commercially available felt-tip pens (“Sniffin’ Sticks,” Burghart GmbH, Wedel, Germany) [15, 16]. For odor presentation, the pen’s cap was removed by the experimenter for approximately 3 sec, and the tip of the pen was placed approximately 1.0–2.0 cm in front of the participant’s nostrils. The test consists of one threshold and two suprathreshold subtests: tests for olfactory thresholds of phenyl ethyl alcohol, odor discrimination (16 triplets with two different odors) and odor identification (16 common odors presented in a four-alternative, forced-choice procedure). The maximum score for each subtest is 16, resulting in a maximum composite score of 48 (threshold, discrimination, and identification [TDI] score). Normal values for the TDI composite score are >30.3, with a cut-off between anosmia and hyposmia at 16.5. According to the TDI scores, the participants were diagnosed as anosmic, hyposmic, or normosmic [13].

Statistical Analysis

All the variables about the questions and the participants were analyzed statistically with SPSS 21.0 for windows software package (SPSS, Inc, Chicago, IL). Normality of data in each group was tested with Kolmogorow Smirnov Test. Data were shown as mean $\pm$ standard deviation for continuous variables and number of cases was used for categorical ones. Categorical data were analyzed by χ^2 or Fisher’s exact test, where appropriate. A *p* value less than 0.05 was considered statistically significant (significant *p* values were shown in italics in Tables).

Results

We asked 2,824 volunteers whether they had olfactory dysfunction or not. A total of 199 (6.7 %) people mentioned that they had, and filled out the questions in our survey. A total of 117 males (59 %) and 82 females (41 %) were included in our study.

The mean age of the surveyed population was 44 ± 15 years, ranging from 18 to 78 years. The analysis was performed in five age groups to ensure a reasonable sample size for each age and gender group. The epidemiological statistics of the surveyed population were shown in Table 2. The responses to the question that how the participants with olfactory dysfunction defined their smell disorders were presented in Table 3.

Table 1 Questions regarding the effects of olfactory dysfunction on life-quality

1. I am having trouble getting the smell
2. I am emotional distress due to the reduction of sense of smell
3. Because of the changes in my sense of smell I avoid groups of people
4. I don't enjoy drinks or food as much as I used to after reduction in sense of smell
5. I am decreased sexual desire after reduction in sense of smell
6. I feel weakness in my memory after reduction in sense of smell
7. The changes in my sense of smell make me feel angry
8. I have to smell an odor several times in order to understand
9. Due to the difficulties with smelling, I am scared of getting exposed to certain dangers (e.g., gas, rotten food)
10. I find other people don't understand my smell problem
11. I feel inadequate because of my sense of smell problem

Table 2 The epidemiological statistics of the surveyed population

Population characteristics	Male, N (%)	Female, N (%)	Total, N	<i>p</i> value
Age (years)				0.5
18–29	18 (49)	19 (51)	33	
30–39	31 (59)	22 (41)	53	
40–49	23 (61)	15 (39)	38	
50–59	26 (62)	12 (38)	38	
>60	19 (58)	14 (42)	33	
Education level				0.09
Primary school	5 (33)	10 (67)	15	
Secondary school	11 (79)	3 (21)	14	
High school	53 (61)	34 (39)	87	
University	48 (59)	35 (42)	83	

When the “Sniffin’ Sticks” olfactory test was conducted with the surveyed participants, anosmia detected in 45 (22.7 %) of 199 participants and hyposmia in 135 (67.8 %). Also, 19 (9.5 %) of 199 volunteers who declared subjective olfactory dysfunction, was found to be normal according to the TDI scores. There was a significant correlation between self-rated olfactory dysfunction and olfactory test ($p = 0.01$, $r = 0.8$).

Forty-seven of the participants (24 %) reported a sudden onset of olfactory dysfunction and 93 (47 %) stated a gradual onset, whereas others were not certain about the timing of onset. Eighty-six participants (43 %) reported a stable course of the disorder, 15 participants (7.5 %) reported an improvement and 35 patients (18 %) reported a worsening. Sixty-three participants (31.5 %) reported variability in the progression of their olfactory dysfunction. The mean duration of olfactory dysfunction was determined to be 5.2 years (min.-max. years: 1–30).

The answers of the participants to the questions about possible reasons for their olfactory dysfunctions, accompanying sinonasal symptoms and related findings were shown in Table 4. As seen in this table, allergic rhinitis and

runny nose were more common in females with subjective olfactory dysfunction, whereas snoring was more common in males.

Almost two-thirds of participants (32.2 %) were smokers, while almost a third (28.1 %) reported to be regularly exposed to toxic or noxious substances, either at home or at work. Men reported a higher exposure to both tobacco smoke (43.6 %, $p < 0.0001$) and noxious substances (34.2 %, $p = 0.01$).

The answers to the questions regarding the effects of the disorder on the daily life (Table 1) were as described below.

Fifty-five percent of the participants responded the statement, “I am having trouble getting the smell” as “almost always” or “always”.

The statement “I am emotionally distressed about the reduction of my sense of smell” aimed to grade the depressive situation due to olfactory dysfunctions. 56 % of the participants answered “never” or “almost never”, whereas 5 % answered “always”.

88 % of the participants answered the statement “Because of the changes in my sense of smell I avoid

Table 3 The participants' responses to the statement "how do you define your olfactory dysfunction"

Self-reported olfactory dysfunction	Male, N (%)	Female, N (%)	Total, N	<i>p</i> value
Anosmia	38 (59)	27 (41)	65	0.9
Hyposmia	70 (61)	44 (39)	114	0.3
Intermittent hyposmia	20 (49)	21 (51)	41	0.1
Parosmia	25 (68)	12 (32)	37	0.2
Phantosmia	6 (32)	13 (68)	19	0.01

Table 4 Possible reasons, accompanying sinonasal symptoms and related findings for self reported olfactory dysfunction

	Male, N (%)	Female, N (%)	Total, N	<i>p</i> value
Possible reasons of olfactory dysfunction				
History of head trauma	9 (69)	4 (31)	13	0.5
Infections of upper respiratory tract	50 (54)	42 (46)	92	0.2
Allergic rhinitis	22 (41)	32 (59)	54	0.002
Sino-nasal symptoms				
Nasal stuffiness	56 (64)	32 (36)	88	0.2
Runny nose	27 (44)	34 (56)	61	0.008
Sneeze	23 (51)	22 (49)	45	0.3
Postnasal drip	50 (68)	24 (32)	74	0.07
Facial pain/pressure	8 (42)	11 (58)	19	0.1
Nasal dryness	40 (68)	19 (32)	59	0.1
Associated findings				
Taste loss	48 (64)	27 (36)	75	0.3
Halitosis	21 (52)	19 (48)	40	0.4
Xerostomia	37 (56)	29 (44)	66	0.6
Snoring	34 (72)	13 (28)	47	0.04
Sexual aversion	15 (50)	15 (50)	30	0.3
Emotional distress	11 (58)	8 (42)	19	0.9
Irregularity of menstrual cycle	–	9	9	

groups of people" as "never" or "almost never", whereas 1.5 % answered as "always".

52 % of the participants answered the statement, "I don't enjoy drinks or foods as much as I used to after the reduction of my sense of smell" as "always" or "almost always", whereas 30 % answered as "never" or "almost never".

86 % of the participants thought that there was no relationship between sexual desire and decreased sense of smell, but it was thought to be "always" or "almost always" by 7 %.

73 % of the participants did not think that there was a relationship between weakness in memory and smell disorder, whereas 10.5 % thought that there was a relationship. Our findings demonstrated that participants in the 20–49 year age group believed that their olfactory dysfunction was related primarily to a memory problem ($p = 0.02$).

54 % of the participants responded the statement "The changes in my sense of smell make me feel angry" as "never" or "almost never", whereas 20 % answered as "always" or "almost always". We found that females became more nervous than males if they could not smell ($p = 0.01$).

49 % of the participants answered the statement, "I have to smell an odor several times in order to understand what it is" as "always" or "almost always", whereas 30 % answered as "never" or "almost never". Our findings showed that females tried harder than males for smelling ($p = 0.01$).

The statement "Due to the difficulties with smelling, I am scared of getting exposed to certain dangers (e.g., gas, rotten food)" was responded as "always" or "almost always" by 49 % of the participants, whereas 30 % responded as "never" or "almost never".

67 % of participants responded the statement "I find that other people don't understand my smell problem" as

“never” or “almost never”. Also, we found that females were complaining about this situation more than males ($p = 0.01$).

We aimed to evaluate the lack of self confidence due to olfactory dysfunctions by the statement, “I feel inadequate because of the problems with my sense of smell”. 51 % of participants answered this question as “never” or “almost never”, whereas 33 % answered as “always” or “almost always”. We determined that females felt more inadequate as compared to males ($p = 0.02$).

Discussion

Our findings showed that (1) females with olfactory dysfunction tried harder than males for smelling and the feeling of inadequacy was more common among females than males. Accordingly, females felt more angry than males due to olfactory dysfunction (2) there was a significant correlation between subjective olfactory complaints and olfactory testing (3) problems in quality-of-life issues are typically reported primarily in the areas of safety and nutrition.

Major determinants of olfactory sensitivity are gender and age. It is well known that women outperform men in almost all aspects of olfactory sensitivity. Although the exact reason for this difference remains unclear, social, hormonal, or genetic factors are thought to be involved [17]. Using different measures, studies have shown a decrease of olfactory sensitivity past the age of 60 [18–20].

Although, 199 participants reported subjective olfactory dysfunction, we found that 9.5 % of those participants had normal olfactory function with olfactory testing. As we know that people tend to confuse nasal obstruction feeling and olfactory function ratings. The prevalence of poorer sensitivity was found to increase with age, and the prevalence of better sensitivity was lower in men than women [9]. In this study, we determined that females aged 20–39 years and males aged 30–59 years were particularly aware of their hyposmia complaints ($p = 0.014$, $p = 0.01$ respectively).

No deterioration in olfactory dysfunction was observed with the increase in age among the participants. However, phantosmia was more frequent in patients with the complaint of headache, particularly among females, ($p = 0.001$). Therefore, olfactory dysfunction accompanied by migraine and other neurological headache complaints may be the subject of a further study.

The incidence of olfactory dysfunction in general population is a matter of debate. Latest studies show that 15 % of the population have already olfactory dysfunction, however in this survey 6.7 % of the volunteers declared about their olfaction problems. This result may be due to

less awareness in our society about the smell disorders and the limited number of the participation to the study.

Conclusion

Disturbances of the chemical senses are frequent. While olfactory loss goes undetected in everyday life of most of these patients, and almost all of them continue their social and professional activities, it may severely alter the quality of life of these people. Problems in quality-of-life issues are typically reported primarily in the areas of safety and nutrition.

Acknowledgments The authors acknowledge the help of Dr Thomas Hummel in the preparation of this article.

Disclosures The authors state that they have no funding, financial relationships, or conflicts of interest.

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