Psychiatria Danubina, 2015; Vol. 27, No. 4, pp 397-405 *Original paper*

SYMPTOM DIMENSIONS, SMOKING AND IMPULSIVENESS IN OBSESSIVE-COMPULSIVE DISORDER

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received: 15.1.2015; revised: 11.6.2015; accepted: 20.6.2015

SUMMARY

Background: *Obsessive-compulsive disorder (OCD) has distinct symptom dimensions with possibly subtle differences in the underlying neurobiology. One behavioral habit, smoking, has been widely investigated in psychiatric disorders, though received less attention in OCD. Here, we aimed to investigate the relationship between symptom dimensions and smoking behavior in OCD.*

Subjects and methods: *OCD patients (n=167) with the symptom dimensions of washing, taboo thoughts and symmetry-counting-repeating-ordering (S+C+R+O) were questioned in terms of smoking status and assessed with the Yale-Brown Obsessive Compulsive Scale (Y-BOCS), Fagerström Test for Nicotine Dependence (FTND), Hamilton Depression Rating Scale-17 Items (HDRS-17), Beck Anxiety Inventory (BAI) and Barratt Impulsiveness Scale-11 (BIS 11).*

Results: *Smoking status differed significantly among patients with distinct symptom dimensions (p=0.009).The ratio of smokers was the lowest in those with the washing (30%, N=12) and the highest in the S+C+R+O (68.2%, N=15) group. Those with taboo thoughts had a smoking ratio of 37.14% (N=39). In post hoc analysis, smoking ratio was significantly higher in the S+C+R+O group than in those with washing symptoms (p=0,004) and taboo thoughts (p=0,007) though it did not differ significantly between washers and taboo thought groups. The BIS-11 did not differ across symptom dimensions.*

Conclusions: *OCD is a heterogeneous disorder in terms of smoking. Impulsiveness, which does not significantly vary across distinct symptom dimensions, cannot explain this heterogeneity. The severity of addiction does not differ in smokers with OCD across symptom dimensions.*

Key words: *obsessive-compulsive disorder – OCD - symptom dimensions – smoking - impulsiveness*

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INTRODUCTION

Some studies investigated the overlaps and distinctions of obsessive-compulsive disorder (OCD) among other anxiety spectrum disorders. Although OCD has long been regarded as an anxiety disorder, this classification has been criticized by certain authors suggesting that OCD has more common features with the disorders that are mainly characterized by impulsiveness rather than anxiety (Bartz & Hollander 2006). An interesting point distinguishing OCD from both anxiety and impulse control disorders (ICDs) is the contradictory findings related to the rates of comorbid alcohol or substance use disorders (SUDs). High substance abuse rates have usually been reported in both ICDs and anxiety disorders (Alegría et al. 2010; Compton et al. 2007, Grant et al. 2004, Grant et al. 2005, Grant et al. 2009). On the other hand, although early studies demonstrated a high co-occurrence of SUDs with OCD (Karno et al. 1988, Riemann et al. 1992), more recent studies showed that the prevalence of substance or alcohol abuse was either not elevated or even slightly lower in OCD patients (Angst et al. 2004, Denys et al. 2004, Fineberg et al. 2013, Lochner et al. 2014).

Most of the studies found that the prevalence of smoking is lower or at least not high in patients with OCD when compared to normal population or to people with other anxiety or mental disorders (Abramovitch et al. 2015, Bejerot & Humble 1999, McCabe et al. 2004, Himle et al. 1988, Subramaniam et al. 2009) although contradicting results were also reported (Lawrence et al. 2009, Torres et al. 2006). In two studies, OCD was associated with high rates of smoking only in females whereas males lacked such an association (Grabe et al. 2001, Wu et al. 2010)

The underlying psychological traits and biological underpinnings of less smoking behavior in OCD, however, have not been entirely revealed. One common psychological trait, impulsiveness has been reported to be a major risk factor for substance-use disorders (SUDs) (Verdejo-Garcia et al. 2008), including nicotine use and dependence (Flory & Manuck 2009). Taken together with the heterogeneous nature in OCD, it is a possibility that patients with distinct symptom clusters could have some differences in terms of impulsivity and smoking behavior.

An important novelty in the DSM-5 (American Psychiatric Association 2013) was that OCD was classified in the same category with ICDs instead of anxiety disorders. Nevertheless, remarkable differences also exist. For instance, obsessive-compulsive behavior is usually associated with an exaggerated sense of danger and harm avoidance whereas impulsiveness is motivated by pleasure-seeking accompanied by an underestimation of risk (Potenza et al. 2009). The

presence of not only similar but also distinct characteristics of OCD and ICDs has led to the conceptualization of a new terminology: "compulsive-impulsive spectrum" disorders (Phillips et al. 2010).

Taken as a whole, the question that needs to be answered is that although ICDs and OCD were considered in the same spectrum in the DSM-5, how could we explain the low rates of dependence or substance/nicotine abuse in OCD though it is frequently comorbid with ICDs? The fact that OCD is a heterogeneous disorder may at least partly respond to this paradox. Many previous studies classified OCD into subtypes by taking the symptomatology, psychobiology, comorbidity, family history, response to treatment and age of onset (early- or late late-onset) (Lochner & Stein 2003) into account. Among these, subtyping OCD by means of symptom clusters has occasionally been employed (Baer 1994, Bloch et al. 2008, Calamari et al. 1999, Leckman et al. 1997, Mataix-Cols et al. 2005, Pinto et al. 2008).

The factor analysis of OCD symptom contents was pioneered by Baer (1994), who found three subtypes that he called contamination/cleaning, symmetry and hoarding and pure obsessions. Later studies divided symmetry and hoarding into distinct groups. Leckman et al. (1997) identified four distinct factors: contamination/ washing; aggressive, sexual and religious obsessions and checking compulsions; symmetry/ordering; hoarding. Mataix-Col et al. (2005) similarly proposed four factors with the same major patterns. Bloch et al. (2008) meta-analyzed 21 studies that, in total, performed the exploratory factor analysis of 5124 obsessive-compulsive patients. They confirmed the four-factor model as follows: contamination/washing; forbidden or taboo thoughts (aggressive, sexual and religious obsessions); symmetry, counting, repeating and ordering; hoarding. There was ambiguity in this study when it came to checking dimension that was associated with multiple symptom subtypes. Pinto et al. (2008) identified five symptom clusters: contamination/washing; taboo thoughts; doubt/checking, symmetry/ordering; hoarding. Five-factor model found by Calamari et al. (1999) differentiated aggressive obsessions from other taboo thoughts.

Different symptom dimensions of OCD are associated with differences in clinical features, genetics, and neurobiology and treatment response. A waxing-and-waning course is more common in patients with taboo thoughts, but less common in those with symmetry symptoms; on the other hand, symmetry symptoms are related to an earlier onset of OCD (Kichuk et al. 2013). Another clinical phenomenon is that distinct symptom clusters are accompanied by different comorbid psychiatric disorders (Hasler et al. 2005). Taboo thoughts and somatic obsessions were found to coexist with anxiety disorders and depression; washing was comorbid with eating disorders and symmetry, repeating, counting; and ordering were co-occurring with bipolar and panic disorder (PD) (Hasler et al. 2005). In the study by Prabhu et al. (2013), the dimensions of taboo thoughts and symmetry were associated with younger age at onset; aggression obsessions were comorbid with anxiety disorders (especially social phobia (SP)); and washing symptoms were characterized by a prominence of female gender, more severe OCD, poorer insight, poorer functioning and more common family history. Family studies have shown that there is a relationship between symptom dimensions and genetic transmission (Hasler et al. 2007, Pinto et al. 2008, Taberner et al. 2009). For example, Katerberg et al. (2010) reported that taboo and doubt factor and the contamination and symmetry/hoarding factor have common genetic influences. An association between estrogen-receptor genes and washing (Alonso et al. 2011) and a trend toward a positive association between 5-hydroxytriptamine transporter-linked polymorphic region and counting and repetition (Cavallini et al. 2002) were reported. Obsessive-compulsives with symmetry and hoarding symptoms were found to be less responsive to citalopram when compared to other patients (Stein et al. 2007). Another study showed a better response to selective serotonin reuptake inhibitors in those with sexual, religious, aggressive and checking symptoms (Landeros-Weisenberger et al. 2010). Exposure and response prevention was more effective in subjects with taboo thoughts and hoarding than in others (Williams et al. 2014). Neuroimaging studies have also indicated some differences among symptom clusters in OCD. In a positron emission tomography study, Rauch et al. (1998) showed a positive correlation between taboo thoughts and regional cerebral blood flow in striatum on both sides of the brain. In a funkcional magnetic resonance imaging (fMRI) study, neural activity decreased in the right insula, thalamus, putamen, dorsolateral prefrontal cortex, and left orbitofrontal cortex in response to contamination stimuli but decreased only in the right insula and right thalamus in response to stimuli related to symmetry obsessions (Gilbert et al. 2009). In the same study, more severe OCD was predictive of lower activity in the right dorsolateral prefrontal cortex during contamination stimuli. Another fMRI study reported increased activity in ventromedial prefrontal areas bilaterally and right caudate nucleus in washers; put amen (globus pallidus), thalamus and dorsal cortex in checkers; left precentralgyrus and right orbitofrontal cortex in hoarders (Mataix-Cols et al. 2004). Harrison et al. (2013) who used resting state fMRI observed that different types of taboo thoughts were associated with difference in findings: Sexual and religious obsessions were associated with ventral striatal-insular connectivity whereas aggressive dimension was associated with connectivity between the ventral striatum, amygdala, and ventromedial frontal cortex.

Given all that was mentioned above, the aim of this study was to explore the impulsiveness and addictive behavior among the symptom clusters in OCD. Specifically, we hypothesized that diverse symptom

clusters in OCD could have different levels of impulsiveness and addictive behavior. In order to test our hypothesis, we focused on smoking behavior as opposed to other substances. In addition, we evaluated the levels of impulsiveness in the study population. To the best of our knowledge, since the current study is the first one investigating smoking or addictive behavior and impulsiveness across symptom dimensions in OCD, we had no prospect on how a distribution would occur among subtypes. As a secondary goal, we investigated the association between levels of dependence and impulsiveness, symptom severity, anxiety and depressive symptoms in our OCD sample.

SUBJECTS AND METHODS

Subjects

Between January 2013 and February 2014, 167 consecutive adult OCD patients who have attended to Uskudar University Neuropsychiatry Health Practice and Research Center Feneryolu Outpatient Department were recruited for this study (age range 18 and 72 years old; 88 women, 52%; 79 men, 48%). We compared three dimensions in accordance with the content of the symptom: 1) Contamination and washing; 2) Taboo thoughts including religious obsessions, sexual obsessions and aggression and checking; 3) Symmetry, counting, repeating and ordering (S+C+R+O). The subdivision of the symptom dimensions was based upon the previous factor analysis studies (Baer 1994, Calamari et al. 1999, Mataix-Cols et al. 2005, Bloch et al. 2008, Pinto et al. 2008). The decision of which group a patient belonged to was based on the principal symptom dominating the clinical picture and distressing the patient the most. Patients suffering from obsessions or compulsions other than these as their principal symptoms were not included. If two or more types of obsession or compulsion were equally severe, such subjects were not included either. We did not include hoarding for several reasons: 1) Most individuals with hoarding symptoms were inpatients; thus, they constituted a group different from our outpatient sample. 2) Outpatient hoarders constituted a group too small to enable statistical analysis. 3) Finally, it is no more accepted as a subgroup of OCD in DSM-5. We also excluded former smokers for two reasons: 1) Including those who once used to smoke in the non-smoking group would have confounded the results; 2) They constituted a group too small to enable statistical analysis. Other exclusion criteria were schizophrenia or any other psychotic disorders, bipolar I or II disorders, any previous head injuries, mental retardation, or any neurological disorders (such as epilepsy or multiple sclerosis) because these may affect impulsive behavior and thus confound the results. The diagnoses of all psychiatric disorders including OCD and alcohol and substance abuse disorders were made based on the DSM-IV criteria. Patients were prescribed serotonin reuptake inhibitors or clomipramine, sometimes combined with other psychopharmacological medications. The study design was approved by The Ethics Committee of Uskudar University and all the subjects gave written informed consent.

Measures

The severity of OCD was assessed by The Yale-Brown Obsessive Compulsive Scale (Y-BOCS) (Goodman et al. 1989), consisting of 19 questions, only 10 of which are taken into account when estimating the total score that may vary 0 to 40. Karamustafalıoğlu et al. (1993) showed the validity and reliability of its Turkish version. In that validity and reliability study, the authors found that Cronbach's coefficient alpha for it was0.82 and item-total score correlations were between 0.37 and 0.69. Inter-rater reliability coefficient was 0.96 for the whole scale, 0.94 for the obsession scale and 0.97 for the compulsion scale. The validity analysis showed that Y-BOCS had a correlation value of 0.54 with The Leyton Obsessional Inventory (Cooper 1970).

Impulsiveness was measured by The Barratt Impulsiveness Scale-11 (BIS-11) (Patton et al. 1995), a 30-item questionnaire, assessing the cognitive (attentional), behavioral (motor), and non-planning aspects of impulsiveness. The total score may vary 30 to 120 since the items are measured on a 4-point Likert scale (1=rarely/never; 2=occasionally; 3=often; 4=almost always/always). Güleç et al. (2008) showed the validity and reliability of its Turkish version. They found that it hada good test-retest reliability and an acceptable internal consistency having a Cronbach's coefficient alpha value of 0.81 in psychiatric patients. It has been the most widely used tool to measure impulsiveness in various patient groups including those with OCD (Boisseau et al. 2012, Ettelt et al. 2007, Filomensky et al. 2012, Tavares & Gentil 2007).

Information about smoking was obtained by partially modified questions in the National Health Interview Survey (NHIS) to identify the smoking situation (http://www.cdc.gov/nchs/nhis.htm). The NHIS is an annual, cross-sectional survey to question health states of individuals in various aspects, conducted in the United States since 1957, designed by Centers for Disease Control and Prevention and financed by the U.S. Census Bureau. Non-smoking was defined as smoking less than 100 cigarettes in one's life; whereas current smoking is defined as cigarette use every day or on some certain days. Those who smoked cigar or pipe were not included in the study.

The Fagerström Test for Nicotine Dependence (FTND), a 6-item questionnaire, is the most frequently used instrument in identifying the severity of nicotine dependence (Fagerström & Schneider 1989). It is the revised form of the Fagerström Tolerance Test (Fagerström 1978). The FTND examines the number of cigarettes smoked per day and the duration that a smoker can endure without smoking. The internal

consistency of the FTND is higher compared to the Fagerström Tolerance Test. The total score may vary 0 to 10. Cronbach's coefficient alpha of its internal consistency has been found to be at 0.61 and its test-retest correlation at 0.88 by Uysal et al. (2004) who studied its Turkish version.

The Hamilton Depression Rating Scale-17 (HDRS-17) is a 17-item instrument to measure the severity of depression (Williams 1978, Turkish version by Akdemir et al. 1996). Its total score may vary 0 to 51. Cronbach's coefficient alpha of its internal consistency is 0.75 and the test-retest correlation is 0.76 for its Turkish version.

The Beck Anxiety Inventory (BAI) is a 21-item self-report questionnaire to measure the severity of psychic and somatic symptoms of anxiety, the total scores of which range from 0 to 63 (Beck et al. 1988, Turkish version by Ulusoy et al. 1996). Its Turkish version has a high internal consistency (Cronbach's coefficient alpha=0.93) and the item-total correlations ranges from 0.45 to 0.72.

Statistical analyses

The mean and standard deviation (SD) for all variables were presented in the tables. Group differences in continuous variables were determined using ANOVA (for parametric data). Post hoc analyses were conducted using Tukey HSD test. Group differences in nominal variables were compared with the chi-square test and Fisher's exact test. Bivariate relationships between two numeric parameters were determined using Spearman's correlations. Statistical analyses were performed using SPSS version 17.0. Two-tailed P values less than 0.05 were considered significant.

RESULTS

Clinical and sociodemographical differences between OCD subtypes

Table 1 shows the means and SDs for study variables among the symptom clusters.The Y-BOCS total score and the compulsion subscale showed significant differences among symptom based subtypes. The washers had the most severe OCD and compulsion scores. In addition, smoking status differed significantly among patients with distinct symptom dimensions. The ratio of smokers was the lowest in the washing and the highest in the S+C+R+O group. The ratio of smoking was significantly high in the S+C+R+O group than in washers (p=0.004) and in those with taboo thoughts (p=0.007) though it did not differ significantly between washers and taboo thought groups. In the whole group, there were 66 current smokers (39.5%) and 101 never-smokers. The ratio of alcohol use disorders or SUDs was 4.2% in the whole sample. Although the ratios of alcohol or substance (other than nicotine) abuse were quite higher in the S+C+R+O group, group differences lacked statistical significance. Regarding the BIS-11 total and its subscales, we did not see significant differences among different subtypes. The comparison of FTND scores among different symptom groups yielded no significant differences.

Table 1. Findings according to the symptom dimensions in 167 patients with OCD

	Washing N=40 (24%)		Taboo thoughts N=105 (63%)		S+C+R+O N=22 (13%)			
	Mean±SD	CI (95%)	Mean±SD	CI (95%)	Mean±SD	CI (95%)	F	P
Age	34.58±9.82	31.43-37.72	31.94±10.47	29.92-33.97	29.82±8.55	26.03-33.61	1.75	0.17
Education (yrs)	13.05±2.94	12.11-13.99	13.31±2.44	12.83-13.78	13.33±1.77	12.53-14.14	0.16	0.85
Y-BOCS	25.55±6.61	23.43-27.67	20.07±7.21	18.67-21.46	22.27±7.00	19.17-25.38	8.89	*<0.001**
Obsession	12.52±3.57	11.36-13.64	11.78±4.34	10.94-12.62	9.77±4.96	7.58-11.97	2.98	*0.05***
Compulsion	13.05±3.67	11.88-14.22	8.33±4.90	7.39-9.28	10.51±3.65	10.81-14.12	19.91	*<0.001****
HDRS-17	16.40±8.96	13.53-19.27	16.61±7.38	15.18-18.04	15.52±8.27	11.83-19.17	0.18	0.84
BAI	18.52±14.41	13.89-23.11	20.65±13.46	18.04-23.27	18.86±13.41	12.92-24.81	0.43	0.65
BIS-11 total	57.81±9.75	54.68-60.92	61.33±10.31	59.34-63.33	61.41±11.24	56.43-66.39	1.80	0.17
CI	15.63±3.90	14.38-16.87	16.69±3.81	15.95-17.42	17.05±4.41	15.09-19.00	1.33	0.27
MI	17.15±3.63	15.99-18.31	18.48±4.46	17.61-19.34	19.18±3.63	17.57-20.79	2.09	0.13
NP	25.02±3.83	23.80-26.25	26.09±4.59	25.20-26.97	24.73±5.21	22.42-27.04	1.33	0.27
	N (%)		N (%)		N (%)			
Never-smoker	28 (70.00)		66 (62.86)		7 (31.82)		*0.009****	
Smoker	12 (30.00)		39 (37.14)		15 (68.18)			
Alcohol/ substance abuse No	39 (97.50)		102 (97.14)		19 (86.36)		0.06	
Alcohol/ substance abuse Yes	1(2.5%)		3 (2.86)		3 (13.64)			

S+C+R+O: Symmetry, counting, repeating and ordering, Y-BOCS: The Yale-Brown Obsession and Compulsion Scale, HDRS-17: The Hamilton Depression Rating Scale, BAI: The Beck Anxiety Inventory, BIS-11: The Barratt Impulsiveness Scale, CI: Cognitive impulsiveness, MI: Motor impulsiveness, NP: Non-planning.
*Post-hoc Tukey: Washing>Taboo, ** Post-hoc Tukey: Washing>S+C+R+O, *** Post-hoc Tukey: Washing>Taboo, S+C+R+O>Taboo, ****Fisher's exact test: S+C+R+O>Washing,S+C+R+O>Taboo. Significant results are in italic.

Table 2. Correlations between outcome variables

			Y-BOCS	Obsession	Compulsion	HDRS-17	BAI
Washing	BIS-11	r	0.071	0.072	0.057	0.307	*0.364**
		p	0.665	0.658	0.727	0.054	0.021
	CI	r	0.227	0.209	0.205	*0.342**	*0.339**
		p	0.159	0.195	0.204	0.031	0.032
	MI	r	0.026	0.006	0.042	0.238	0.289
		p	0.872	0.971	0.798	0.139	0.071
	NP	r	0.045	0.078	0.005	0.290	*0.345**
		p	0.783	0.632	0.974	0.070	0.029
	FTND	r	0.152	0.203	0.077	0.170	0.121
		p	0.349	0.210	0.636	0.293	0.458
Taboo thoughts	BIS-11	r	*0.211**	0.138	0.179	0.019	0.046
		p	0.030	0.162	0.068	0.846	0.645
	CI	r	*0.235**	0.130	*0.247**	0.192*	*0.196**
		p	0.016	0.186	0.011	0.050	0.046
	MI	r	0.167	*0.197**	0.060	-0.033	-0.005
		p	0.089	0.044	0.543	0.740	0.959
	NP	r	0.136	0.024	0.163	-0.074	-0.045
		p	0.167	0.811	0.096	0.450	0.652
	FTND	r	0.069	0.076	0.013	-0.178	-0.120
		p	0.488	0.448	0.894	0.072	0.228
	Barratt-11	r	-0.103	-0.156	0.013	-0.052	-0.077
		p	0.648	0.489	0.953	0.818	0.735
S+C+R+O	BIS-11	r	0.029	-0.082	0.167	0.155	0.203
		p	0.899	0.716	0.457	0.492	0.365
	CI	r	-0.262	-0.199	-0.233	-0.114	-0.148
		p	0.239	0.376	0.296	0.613	0.511
	MI	r	-0.074	-0.150	0.063	-0.147	-0.180
		p	0.745	0.505	0.782	0.514	0.422
	NP	r	0.031	-0.089	0.180	0.112	0.291
		p	0.891	0.695	0.422	0.619	0.190

Y-BOCS: The Yale-Brown Obsession and Compulsion Scale, HDRS-17: The Hamilton Depression Rating Scale, BAI: The Beck Anxiety Inventory, BIS-11: The Barratt Impulsiveness Scale, CI: Cognitive impulsiveness, MI: Motor impulsiveness, NP: Non-planning, FTND: The Fagerström Test for Nicotine Dependence, S+C+R+O: Symmetry, counting, repeating and ordering.
*Correlation is significant at the 0.05 level (2-tailed). Significant results are in italic.

Correlations between independent variables

Table 2 shows the correlations of the BIS-11 total, cognitive impulsiveness (CI), motor impulsiveness (MI), non-planning (NP) and the FTND scores with those of the Y-BOCS (and its obsession and compulsion subscales), HDRS-17 and BAI in smokers with distinct symptom dimensions. No correlation was found in the smokers with S+C+R+O symptoms. In the washers who smoke, the BAI scores were positively correlated with the scores of the BIS-11 total, CI and NP and the HDRS-17 scores were positively correlated with the scores of CI. In the smokers with taboo thoughts, there were positive correlations between the scores of the BIS-11 and Y-BOCS and between the scores of MI and obsession. The smokers with taboo thoughts also showed positive correlations between the scores of CI and the scores of the Y-BOCS, compulsion, HDRS-17 and BAI.

DISCUSSION

Our primary aim in this study was to investigate the rates of smoking behavior and to compare the levels of dependence and impulsiveness among OCD patients exhibiting diverse symptom clusters. In the light of our results, the significantly different distributions of smoking behavior among groups partly supported our hypothesis. Smoking was the least prevalent in the patients with washing obsessions (30%) and the most prevalent in the S+C+R+O group (68.18%). A smoking ratio of 37.14% was found in obsessive-compulsives with taboo thoughts. On the other hand, we failed to show different levels of impulsiveness among different symptom dimensions. The severity of addiction did not differ among smokers with distinct symptom dimensions.

Although the difference in the rates of smoking among symptom dimensions is apparent, our findings cannot make it possible to explain the reasons for this

difference. Even impulsiveness that was reported to be related to smoking in literature (Flory & Manuck 2009) did not show a significant difference among symptom dimensions. Studies comparing symptom dimensions in OCD have found both psychological and biological differences. For example, Brakoulias et al. (2014) conducted the Obsessive-Beliefs Questionnaire (OBQ) to their patients and found that symmetry-order symptom dimension was characterized by perfectionism and intolerance of uncertainty, religious-sexual symptom dimension by increased importance and control of thoughts and doubt and checking dimension by responsibility and threat estimation whereas no subscale of OBQ came into prominence in washing dimension. On the other hand, van den Heuvel et al. (2009) found that partially different parts of the frontostriatothalamic system were involved in OCD patients with different symptom dimensions. However, since our study is the first one comparing symptom dimensions in accordance with smoking, previous research is yet far from illuminating which factors are responsible for differences in smoking habits in OCD patients with different symptoms.

Neither the total scores of impulsiveness nor its subscales of cognitive, motor and non-planning differed across symptom groups. For example, the impulsiveness scores of the patients with washing obsessions, who had the least prevalence of smoking, were quite similar to the scores of those in the S+C+R+O dimension. We did not compare impulsiveness between the smokers and never-smokers since numbers diminishing by divided into subgroups did not enable significant analyses. However, it seems that the distribution of smoking across symptom dimensions does not parallel impulsiveness. Previous research comparing impulsiveness in smokers and non-smokers has reported that impulsiveness is related to smoking in both obsessive-compulsive (Abramovitch et al. 2015, Bejerot & Humble 1999) and non-clinical (Flory & Manuck 2009) samples. Bejerot & Humble (1999) hypothesized that frontal activity that is hyperactivated in OCD may be further increased by nicotine, aggravating OCD symptoms and resulting in a lack of positive reinforcement. On the other hand, addiction and impairment in impulse control might be related to orbitofrontal hypoactivity (Winstanley 2007), restoration of which by nicotine can be rewarding. Therefore, it may be possible that OCD patients may have different motivations for smoking when compared to other people.

Despite the obvious differences in rates of smoking in patients with different principal symptoms, the severity of addiction measured with FTND did not show significant differences across symptom dimensions in smokers. An explanation may be that addiction severity reaches similar levels once smoking begins. That is, certain symptom dimensions might be associated with protecting against or initiating smoking, but not with remaining light smoker or aggravation of addiction. Flory & Manuck (2009) also found that some traits associated with smoking status are not associated with tobacco addiction. It has been reported that initial substance use is influenced by factors such as its availability and rewarding properties while addiction development is concerned with the inability to control using. This has been explained by the fact that increased dopaminergic activity in the mesolimbic reward system establishes a ground for initial drug use whereas chronic use or compulsive drug taking represents some pathology in the frontostriatal system (Robinson & Berridge 2003). Another hypothesis is that the inability to control substance use once it is launched is related to the frontal cortex physiology that was already impaired before the initial use (Dawe et al. 2004). Given that different symptom dimensions in OCD might be associated with different parts of the frontostriatal system (van den Heuvel et al. 2009); the neurocircuitries or biochemistry (for example, dopaminergic activity) related to initial use or chronic taking substance may differ in different symptom dimensions.

The severity of depressive symptoms and anxiety didnot significantly change across symptom dimensions. The comparison of depression and anxiety in smokers and never-smokers within a distinct symptom dimension would not produce trustable results due to the fact that their numbers decreased to small quantities in the washing and S+C+R+O dimensions. The problem of small samples was apparent in correlation analyses. For example, although correlation coefficient rose to 0.818 in the S+C+R+O group, the number of correlations of significance was 0 in them. The inconsistent pattern of significant correlations does not allow making reliable comments.

The rate of smoking was 39.5 in our sample, which did not include former smokers. Since our goal was to make comparisons among symptom dimensions, we did not include a control group; however, when epidemiological studies in Turkey are considered, it seems that the rate of smoking in OCD patients is low. Former studies found the prevalence of smoking 60.3% in Istanbul (Ögel et al. 2003) and 45-70 % all over Turkey (Ögel 2010). These results are consistent with the studies showing the low prevalence of smoking in OCD patients in the countries where smoking is not as common as it is in Turkey (Abramovitch et al. 2015, Bejerot & Humble 1999). McCabe et al. (2004) compared the rates of smoking across anxiety disorders and found that 40.4% of individuals with PD, 22.4 of those with OCD and 20% of those with SP were smokers. Another study found that the prevalence of smoking was at least three times as common in panic disorder, social phobia, simple phobia and generalized anxiety disorder (GAD) as in OCD (Himle et al. 1988). In another study recruiting 9702 young male adults, all axis I disorders were strongly associated with the increased odds ratios of smoking ($p<0.005$), only with the exception of OCD and schizoaffective disorder (Subramaniam et al. 2009). Johnson et al. (2000) denoted an increased risk for the association between smoking and GAD, agoraphobia and panic disorder during adolescence and young adulthood while such an

association was not observed for OCD and social phobia. On the other hand, Lawrence et al. (2009), who included a large sample (8841 people, 168 or 1.9% of whom were obsessive-compulsives), showed that the rates of smoking were 41.1% in OCD patients, 22.3% among total persons and 18.8% among those with no mental disorders. In that study, the rates of smoking in OCD were higher than in SP, post-traumatic stress disorder, depression and dysthymia and slightly higher than in PD whereas smoking rates in OCD were lower than in GAD and bipolar disorder. Torres et al. (2006) demonstrated that 65% of the people with OCD, 56% of those with other neuroses and 37.4% of non-neurotic comparison group were current smokers. Two studies found a significant association between OCD and smoking only in females while OCD was not associated with an increased prevalence of smoking in males (Grabe et al. 2001, Wu et al. 2010).

Alcohol or substance abuse (other than nicotine) in our sample was also of low prevalence (4.2%), congruent with some studies (Kashyap et al. 2012, Tavares & Gentil 2007). Mancebo et al. (2009) found that the prevalence of the current SUDs was low, but that of lifetime SUDs was high in OCD. MacDonald et al. (2004) found a modest association between subclinical anxiety and later alcohol use disorder; however, they failed to find an association between the diagnosis of anxiety disorder and later alcohol use.

The major importance of the current study is that it is the first one comparing smoking status across the symptom dimensions of OCD. On the other hand, this study has some shortcomings. Although our sample is relatively large, such epidemiological data may require a larger sample size to draw firm conclusions. A prominent weakness of our study is that we had few patients in the S+C+R+O group, which had the greatest proportion of smokers. Comparing smokers and non-smokers within a certain symptom dimension (for example, investigating if washers who smoke and do not smoke differed in the severity of clinical measures) could add to our understanding of the relationship of OCD and its symptom structure with smoking. This study demonstrated that symptom dimensions differed in terms of smoking status; however, diminishing samples divided into smaller subsamples did not enable a reliable comparison of smokers to non-smokers having the same principal symptom type (i.e., only 12 of the washers were smokers and 7 of the S+C+R+O group were non-smokers). We also failed to find an explanation associated with differences of smoking status among patients with different symptom dimensions. Despite the observed differences, the biological underpinnings for the observed differences are yet to be entirely revealed. Future studies should consider investigating the causal relationship between smoking status and the dimensions of OCD symptoms. Researching alcohol and SUDs other than nicotine in different symptom dimensions of OCD will be interesting.

CONCLUSIONS

Distinct symptom dimensions of OCD shows heterogeneity in terms of smoking in contrast to impulsiveness, anxiety and depression. Although OCD patients with certain symptom dimensions are smokers much more often, the severity of addiction does not differ in smokers with different symptom dimensions.

Acknowledgements: None.

Conflict of interest: None to declare.

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