Journal of Affective Disorders 133 (2011) 300–304

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Research report

Age at onset in Canadian OCD patients: Mixture analysis and systematic comparison with other studies

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ARTICLE INFO

Article history:
Received 17 October 2010
Received in revised form 18 March 2011
Accepted 28 March 2011
Available online 4 May 2011

Keywords:
Age at onset
OCD
Kolmogorov–Smirnov test

ABSTRACT

Objective: This study aimed to determine the distributions of the age at onset (AAO) using mixture analysis and better develop the understanding of AAO as a clinical feature of obsessive–compulsive disorder.
Method: Mixture analysis was used to identify sub-groups characterized by differences in AAO. Clinical features were analyzed for differences in AAO sub-groups using mixture analysis. Comparisons were made with AAO cut-offs used in previous studies using the 2-Sample Kolmogorov–Smirnov Test.
Results: Mixture analysis of our sample (n = 196) yielded a combination of 2 normal theoretical distributions with means (SD) of 9.66 (3.12) for the early-onset sub-group and 21.1 (8.36) years for the late-onset sub-group. The sub-groups were divided by a cut-off of 15 years. As expected, a negative correlation was found between AAO and duration of illness.
The early-onset subjects had significantly lower age at the time of the assessment and they tended to have more often panic attacks but were treated less often with benzodiazepines and other anti-anxiety medications.
The comparison analysis showed significant difference in the AAO distribution between our sample and four other study samples.
Conclusions: Our findings support the notion that different AAO sub-groups correspond with differences in clinical presentations of obsessive–compulsive disorder.

1. Background

Obsessive–compulsive disorder (OCD) is characterized by recurring, intrusive thoughts (obsessions) and repetitive stereotypic behaviours performed to alleviate the anxiety associated with those thoughts (compulsions). The age at onset (AAO) of obsessive–compulsive disorder (OCD) has been shown to play a significant role at clinical, neurobiological, and genetic levels of the illness (Eichstedt and Arnold, 2001). With epidemiological data suggesting lifetime prevalence between 1 and 3%, OCD is a complex disease with a median AAO of 19 years, and earlier onset has often been shown to have a greater familial contribution (Flament et al., 1988; Kessler et al., 2005; Valleni-Basile et al., 1994; Walitza et al., 2010).

Most of the relevant literature supports the notion that different AAO subtypes correspond with variations in clinical presentation of OCD. More specifically, early-onset OCD has been associated with tic disorders (Miguel et al., 2001; Swedo et al., 1989), male gender (Zohar et al., 1997), and higher frequency of tic-like compulsions, sensory phenomena or compulsions not triggered by obsessions (Geller et al., 1998; Rosario-Campos et al., 2001). Moreover, a study by Maina

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doi:10.1016/j.jad.2011.03.041

et al. found a greater incidence of obsessive–compulsive personality disorders in early-onset OCD patients relative to those with a later onset (Maina et al., 2008). This study delineated early AAO as onset at or under the age of 10 and later AAO as at or over 17 years of age. Additionally, Mancebo et al. (2008) found support in their work for male preponderance in OCD as well as differences in clinical presentation with onset of the illness in early childhood and in adolescence. Other studies have found associations between earlier onset and the following clinical features: comorbidity with somatoform, eating and impulse-control disorders, greater family history of obsessive–compulsive symptoms, greater symptom severity, and higher treatment resistance (de Mathis et al., 2008; de Mathis et al., 2009; Janowitz et al., 2009; Lomax et al., 2009; Ulloa et al., 2007).

Taking into consideration this body of literature, the present study aimed to determine the distributions of the age at onset (AAO) using mixture analysis. As far as we know this approach has not been tested in North American OCD samples however Delorme et al. (2005) employed the technique in a European sample and found significant clinical differences in their two AAO distributions (2004). We aimed to obtain a clearer picture of AAO distributions of our Canadian OCD sample through this analysis and better develop understanding of AAO as a clinical feature of obsessive–compulsive disorder.

2. Methods

The studied sample consisted of 196 patients assessed at the Clinic for OCD & Related Disorders at Sunnybrook Health Sciences Centre who were previously recruited for an ongoing OCD research study. The following assessment measures were administered: the Structured Interview for the DSM-IV/Patient Edition (SCID-I/P) Research Version, Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), and OCD Spectrum Disorder Check-List (for tic disorders, etc.).

In order to determine the best-fitting models of the observed AAO, mixture analysis was used on the study sample data. This analysis performs a decomposition of the age at onset distribution into the mixture of normal components. In addition, this analytic method estimates the number of components of such a mixture. The best-fitting model is then chosen based on the highest p-value of the Chi-square (χ^2). A non-significant χ^2 value indicates that the theoretical model does not deviate from the empirical distribution function of AAO in the sample. AAO cut-off points were derived using theoretical AAO function and calculating each patient's probability of belonging to each sub-group.

Pearson Chi-square (χ^2) test was used to compare early and late-onset sub-groups with respect to the following: age, gender, ethnicity, Axis I comorbidity (i.e. OCD spectrum), and medication profile (SSRI, benzodiazepine, and TCA).

Finally, we compared our results with those from previous studies applying two different statistical methods: two-sample Kolmogorov–Smirnov and Pearson Chi Square using a classic contingency table after we applied the same cut-off of the reviewed study to our sample. The inclusion criteria for the studies to be included were the following: clearly outlined AAO cut-offs, studies focusing on both early and late-onset groups, and a clearly stated count of individuals in both onset groups.

3. Results

A total of 196 OCD patients (86 male, 110 female) were included in the study (Table 1). Our overall sample distribution had a mean of 14.79 (8.343) and was not a normal distribution (Fig. 1). Mixture analysis was conducted to yield a combination of two or three or four normal theoretical distributions. The best-fitting two-component model had means (SD) of 9.7 (3.1) and 21.1 (8.4) years for the early- and late-onset distributions, respectively ($\chi^2 = 6.19$, 2df $p = 0.04$) (Fig. 2). The composition was as follows: 55.4% of the sample was early-onset and 44.6% was late-onset. The two sub-groups were divided by AAO with 15 years as an ideal cut-off, characterized by the point at which the two curves intersect (Fig. 2). From our data, the AAO distribution with the higher SD identified the late-onset OCD (>15 years) and represented 44.6% of the sample. Thus, at age 15 ($n = 10$) the probability of belonging to the early-onset distribution is 50.1% (early AAO probability density/total probability density), whereas the probability of belonging to the late-onset is 49.9%. The subjects with onset at 15 were therefore included in the early-onset group.

For the best-fitting three-component model, the mean ages (SD) were 6.4 (1.0), 11.3 (2.6), and 21.8 (8.2) years for the early-, intermediate-, and late-onset distributions, respectively ($\chi^2 = 8.2327$; 2df $p = 0.0163$). The three-component model was not the best-fitting model given the higher significance in the distribution probabilities and was thus discarded.

For the level of uncertainty of group allocation for an individual, this was obtained by subtracting the maximal group membership probability from one. The uncertainty was higher in the early-onset distribution since we included the individuals with onset at 15 in this group. Moreover, there were two outliers in the late-onset group.

With regard to clinical characteristics, using standard χ^2 analysis, we did not find significance difference in ethnicity, sex, education, or other demographic variables analyzed between the early and late-onset groups (Table 1). However the early-onset subjects had significantly lower age at the time of the assessment. As expected, a negative correlation was found between AAO and duration of illness ($r = -.439$; $p < 0.001$).

Significant differences were not found in terms of comorbidity of early and late-onset groups with other Axis I

Table 1
Demographic data for OCD sample.

	Early	Late	p-values
Age	37.7 +/− 11.84	40.06 +/− 12.24	0.014
M/F	59/70	27/40	0.467
White/Others	110/15	60/4	0.213
Single status	70/51	33/33	0.302
Education	4.41 +/− 1.43	4.33 +/− 1.29	0.694
Catholic	30/51	21/33	0.828
Jewish	12/69	10/44	0.568

The binary variables (i.e. gender) are expressed as counts (present/absent).