DATES OF BIRTH AND SEASONAL CHANGES IN WELL-BEING AMONG 4904 SUBJECTS COMPLETING THESEASONAL PATTERN ASSESSMENT QUESTIONNAIR

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ABSTRACT

Background: Abnormal distributions of birthdates, suggesting intrauterine aetiological factors, have been found in several psychiatric disorders, including one study of out-patients with Seasonal Affective Disorder (S.A.D.). We investigated birthdate distribution in relation to seasonal changes in well-being among a cohort who had completed the Seasonal Pattern Assessment Questionnaire (SPAQ).

Method: A sample of 4904 subjects, aged 16 to 64, completed the SPAQ. 476 were cases of S.A.D. on the SPAQ and 580 were cases of sub-syndromal S.A.D. (S-S.A.D.). 92 were interview confirmed cases of S.A.D. Months and dates of birth were compared between S.A.D. cases and all others, between S.A.D. and S-S.A.D. cases combined and all others, and between interview confirmed cases and all others. Seasonality, as measured through seasonal fluctuations in well-being on the Global Seasonality Scores (GSS) of the SPAQ, was compared for all subjects by month and season of birth.

Results: There was no evidence of an atypical pattern of birthdates for subjects fulfilling criteria for S.A.D., for the combined S.A.D. / S-S.A.D. group or for interview confirmed cases. There was also no relationship between seasonality on the GSS and month or season of birth.

Limitations: Diagnoses of S.A.D. made by SPAQ criteria are likely to be overinclusive.

Conclusion: Our findings differ from studies of patients with more severe mood disorders, including psychiatric out-patients with S.A.D. The lack of association between seasonality and birthdates in our study adds credence to the view that the aetiology of S.A.D. relates to separable factors predisposing to affective disorders and to seasonality.

Key Words: Seasonal Affective Disorder, birth rate, seasons, depressive disorder.

INTRODUCTION

Since the 1970s, evidence has accumulated of atypical season of birth patterns among people with various psychiatric disorders. These findings yield important clues about pathogenesis, most plausibly of environmental factors operating during foetal development, while studies showing normal birthdate distributions focus attention on other aetiological possibilities.

Evidence is strongest for a winter / early spring excess of births among people who develop schizophrenia (Torrey et al, 1997; Castrogiovanni et al, 1998). There is evidence of an excess birth rate in the spring / early summer months among sufferers of anorexia nervosa (Rezaul et al, 1996; Eagles et al, 2001; Watkins et al, 2002), and a report of increased suicide rates among people born at this same time of year (Salib and Cortina-Borja, 2006). A recent large study detected no association between month of birth and prevalence of autistic spectrum disorders (Kolevzon et al, 2006).

For severe affective disorders, there appears to be an excess in winter / early spring births similar to that in schizophrenia (Torrey et al, 1997; Castrogiovani et al, 1998; Hare, 1975; Mino et al, 2000) but one large Danish study found a normal birth date distribution in bipolar affective disorder (Mortensen et al, 2003). The first published study on Seasonal Affective Disorder (Pjrek et al, 2004) reported on an Austrian cohort of patients, finding an excess of spring / summer births. We investigated whether a similar pattern prevailed among a large cohort of subjects previously screened for seasonal changes in well-being.

METHODS

Our data derive from an epidemiological study of Seasonal Affective Disorder (S.A.D.) in northeast Scotland (Eagles et al, 1999). The sample comprised 4904 subjects aged 16 to 64 years, of whom 65% were female, all of whom completed the Seasonal Pattern Assessment Questionnaire (SPAQ) (Rosenthal et al, 1987) which is the most widely used screening questionnaire for S.A.D. The 4904 subjects were composed of 4557 patients who were attending their general practitioners in January, plus a randomly selected community sample of 347 subjects. No differences had been detected in SPAQ scores between these two groups of subjects. The overall participation rate was 73%.

The SPAQ gives rise to diagnostic criteria for S.A.D. and for the milder variant sub-syndromal-S.A.D. (S-S.A.D.) (Kasper et al, 1989). In our cohort, 476 / 4904 (9.7%) satisfied SPAQ criteria for S.A.D. and a further 580 / 4904 (11.8%) satisfied SPAQ criteria for S-S.A.D. The SPAQ contains a section which yields a Global Seasonality Score (GSS) which comprises six areas of well-being (mood, sleep, energy, social activity, weight and appetite). Each area is rated on a 0 to 4 scale, so that GSS ranges from 0 to 24 and denotes overall severity of seasonal changes.

In our original study (Eagles et al, 1999), subjects satisfying SPAQ criteria for S.A.D. were invited for interview to determine whether they also satisfied DSM-IV criteria (American Psychiatric Association, 1994) for recurrent major depressive episodes with seasonal pattern. Interviewed subjects (seen in January or February) also completed the Structured Interview Guide for the Hamilton Rating Scale – Seasonal Affective Disorder Version (SIGH-SAD) (Williams et al, 1988; Terman and Williams, 1994). An "interview confirmed case" of S.A.D. scored a minimum of 15 on the

SIGH-SAD, with at least 6 on the atypical symptoms questions, while also fulfilling DSM-IV criteria. The "interview confirmed cases" numbered 92, this being 41% of the 225 interviewed subjects.

The re-analysis of our data sought to investigate any possible relationship between our cohort's birthdates and seasonal pathology as rated in the SPAQ. Subjects with S.A.D. on the SPAQ were compared against all others, and a coalesced group of subjects with "winter problems" (all those fulfilling criteria for either S.A.D. or S-S.A.D.) were compared against all other subjects. Since season of birth effects may be gender specific (Eagles et al, 1995), comparisons were also conducted separately for males and for females. The 92 interview confirmed cases of S.A.D. were compared against all other subjects. After adjustment for the number of days in each month, the proportion of cases and controls born in each month was calculated and two statistical tests were conducted. Firstly, a chi-squared test investigated relationships between month of birth and case / control status. Secondly, the non-parametric Watson's U^2 test (Mardia and Jupp, 2000) was performed. This test has the advantage of using actual dates of birth (rather than month of birth) and accounts for birthdays lying along a circular continuum. One-way analysis of variance was performed to assess whether there was any difference in Global Seasonality Scores (GSS) by month of birth or by season of birth across the complete cohort. Seasons were defined by quarters of the year.

RESULTS

The percentages of subjects with SPAQ rated S.A.D. or with winter problems (S.A.D. and S-S.A.D. combined) show the distribution of their months of birth was very

similar to the comparison groups of subjects with lesser seasonal fluctuations in well-being (see Table).

Table about here

Comparing subjects with SPAQ rated S.A.D. against all others there was no statistically significant difference using either test: $X^2 = 9.23$, df = 11, p = 0.60 and Watson's $U^2 = 0.078$, $0.25 < p < 0.5$. There was also no significant difference between subjects with and without winter problems: $X^2 = 8.19$, df = 11, p = 0.70 and Watson's $U^2 = 0.064$, $p > 0.5$.

Comparing subjects with SPAQ rated S.A.D. against all others, there was also no evidence of differences for males ($X^2 = 17.71$, df = 11, p = 0.09; Watson's $U^2 = 0.055$, $p > 0.5$) or for females ($X^2 = 11.31$, df = 11, p = 0.42; Watson's $U^2 = 0.085$, $0.25 < p < 0.5$). When comparing subjects with and without winter problems, there was no significant difference for females ($X^2 = 6.27$, df 11, p = 0.86; Watson's $U^2 = 0.047$, $p < 0.05$); for males, Watson's U^2 did not find a difference ($U^2 = 0.088$, $0.25 < p < 0.05$) but one emerged with chi-squared ($X^2 = 20.61$, df = 11, p = 0.038). The chi-squared test indicated more winter problems than expected for men born in February, March, June, July and November, and fewer winter problems than expected for men born in January, May, August and September.

Analyses of variance found no evidence of a difference in the mean Global Seasonality Scores by month of birth (F = 0.496, p = 0.91) or by season of birth (F = 0.263, p = 0.85).

There was also no evidence that the 92 interview confirmed S.A.D. cases had different birth date patterns to other subjects (X^2 = 7.78, df = 11, p = 0.73; Watson's U^2 = 0.077, 0.25 < p < 0.5).   For comparison with the data of Pjrek et al (2004), the numbers (and percentages) of these 92 subjects born in each quarter of the year were: January through March - 29 (31.5%); April through June - 25 (27.2%); July through September - 16 (17.4%); October through December - 22 (23.9%).

DISCUSSION

This paper studied birthdates in subjects diagnosed with S.A.D. and S-S.A.D. on the SPAQ. It also looked at the birthdate distributions of a smaller group of 92 subjects with more tightly defined S.A.D. and at possible links between birthdates and Global Seasonality Scores on the SPAQ. In general, we found no evidence of seasonal effects. The one exception to this was for males with "winter problems" (S.A.D. or S-S.A.D. on the SPAQ), for whom a chi-squared test for month of birth detected a difference at the p < 0.05 level of significance. No difference was detected using the Watson's U^2 test (Mardia and Jupp, 2000) which is likely to be better at detecting seasonal differences since it accounts for birthdays lying along a circular continuum. Furthermore, month by month differences appeared random rather than seasonal. We concluded that this was likely to constitute a chance finding in a study which conducted 15 statistical comparisons.

The spur to re-analyse our data from the original study (Eagles et al, 1999) arose from the more recent paper by Pjrek et al (2004). This paper investigated the distribution of birthdates among 553 out-patients who had presented with S.A.D. to psychiatric services in Vienna between 1994 and 2003. They found an excess of

births in the second and third quarters of the year. Within their sample, patients with melancholic depression had a different pattern of birthdates with higher rates in autumn and winter.

The differences between their findings and ours merit consideration. There are no huge sociocultural or latitudinal differences between Vienna (48°N) and Aberdeen, UK (57°N). The sample sizes were broadly similar with 553 in Vienna and 476 with S.A.D. (1056 with S.A.D. or S-S.A.D.) in Aberdeen. Comparison groups were different, but equally valid; in Vienna patients were compared against the general Austrian population and in Aberdeen against subjects without seasonal pathology who completed the SPAQ under the same circumstances as affected subjects. The major difference between the cohorts comprises their mode of presentation to medical services, and thus the likely prevalence and severity of depressive symptoms. In Vienna, patients were presenting to psychiatric services for treatment of an established diagnosis of mood disorder. In Aberdeen, subjects had no such diagnosis. As a later study determined, most of these patients were attending in primary care for symptoms unrelated to depression (Eagles et al, 2002).

Of our entire cohort only the 92 interview confirmed cases fulfilled the same criteria on the SPAQ and in DSM-IV as the Austrian patients. We could not confirm the finding in the Pjrek et al (2004) paper of an excess of births in the second and third quarters of the year, during which quarters 41/92 (45%) were born. However, 92 is a small number on which to conduct a study of seasonality of birthdates, and this finding should be viewed cautiously.

In essence, while both the Vienna and non-interviewed Aberdeen samples fulfilled criteria for S.A.D. on the SPAQ, the Aberdeen patients were less likely to be clinically depressed. The SPAQ is the most widely used screening instrument for S.A.D., but diagnoses of S.A.D. on the SPAQ identify a milder disorder than diagnoses using DSM-IV criteria (Eagles et al, 1999). While the ability of the SPAQ to elicit seasonal fluctuations in well-being is not contested, it does not evaluate current or recurrent depressive symptoms in any detail and this has led to the development of other screening tests, such as the Seasonal Health Questionnaire (Thompson and Cowan, 2001).

S.A.D. has been characterised as the morbid extreme of a spectrum of seasonal variation in well-being (Madden et al, 1996). However, there is clinical (Lam et al, 2001) and genetic (Johansson et al, 2003; Willeit et al, 2003) support for the hypothesis that seasonal depression represents an interaction of the two separate factors of seasonality and affective disorder (Lam et al, 2001). Thus, if one has only affective disorder then it will be non-seasonal, but to have S.A.D. one requires a predisposition to both depression and to seasonal changes in well-being. Within this model, while our Aberdeen sample had seasonal changes in well-being, the majority did not have clinical depression, and they exhibited no abnormality in the pattern of their dates of birth. The Vienna cohort, in comparison, were depressed and it is of interest that the symptomatology of their depression also differentiated the patients by birthdates.

Thus, what the current study may contribute is the suggestion that, while seasonal changes in well-being may be genetically determined (Madden et al, 1996; Johansson et al, 2003; Willeit et al, 2003), seasonality per se does not have a

relationship with date of birth. As in non-seasonal types of mood disorder (Torrey et al, 1997; Castrogiovanni et al, 1998; Hare, 1975; Mino et al, 2000), however, people with S.A.D. may exhibit an atypical pattern in their dates of birth (Pjrek et al, 2004), which relates to a predisposition to depression but not to seasonality.

Table

Months of birth of subjects with SPAQ rated Seasonal Affective Disorder (S.A.D.), Subsyndromal Seasonal Affective Disorder (S-S.A.D.) and comparison groups

Month	S.A.D. – N(%)	Not S.A.D.-N(%)	S.A.D. plus S-S.A.D.-N(%)	No winter problems – N(%)
January	39 (8.2)	374 (8.4)	86 (8.1)	327 (8.5)
February	37 (7.8)	337 (7.6)	81 (7.7)	293 (7.6)
March	53 (11.1)	378 (8.8)	108 (10.2)	323 (8.4)
April	44 (9.2)	362 (8.3)	85 (8.0)	321 (8.3)
May	39 (8.2)	397 (8.9)	90 (8.5)	346 (9.0)
June	33 (6.9)	395 (8.7)	91 (8.6)	337 (8.8)
July	41 (8.6)	400 (9.0)	100 (9.5)	341 (8.9)
August	39 (8.2)	326 (7.4)	76 (7.2)	289 (7.5)
September	31 (6.5)	376 (8.3)	73 (6.9)	334 (8.7)
October	44 (9.2)	399 (9.0)	96 (9.1)	347 (9.0)
November	37 (7.8)	306 (7.0)	72 (6.8)	271 (7.0)
December	39 (8.2)	378 (8.5)	98 (9.3)	319 (8.3)
All months	476	4428	1056	3848

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