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Birth Month and Course of Recurrent Depressive Disorders in a Polish Population

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Background: The aim of this study was to determine whether the specific season of the year during which the first trimester of pregnancy takes place is significantly associated with the course (intensification and frequency of occurrence) of an episode of recurrent depressive disorder in adult life.

Material/Methods: We enrolled 184 patients treated for recurrent depressive disorders.

Results: An analysis of the results obtained indicates that the greatest number of people suffering from a major depressive episode were born in the spring and summer (from April to September), meaning that the first trimester of pregnancy occurred between October and March. However, our results were not statistically significant, perhaps due to the small size of the examined group.

Conclusions: The results obtained indicate that birth month may be significantly associated with the course of recurrent depressive disorders. In patients from Central Europe, the first trimester of pregnancy falling in autumn and winter seems to be significant. These results need to be interpreted with caution due to the small size of the examined group.

MeSH Keywords: Depression • Seasonal Affective Disorder • Seasons

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Background

Many reports have found an association of birth season with the occurrence, intensification, and clinical course of mental disorders [1–3]. The etiology of schizophrenia [4,5] and bipolar affective disorder [6] has been studied most thoroughly so far, and the importance of the virus hypothesis for their development was emphasized [7]. However, there are few publications that focus on the association between the season of birth the intensification of depressive disorders in children and adults. Disanto et al. [8] carried out wide-ranging studies on a British population (*N*=57.971), examining the risk of developing schizophrenia, bipolar affective disorders, and depression. For depression, the association between the month of birth and the occurrence of the disease was the weakest, while people born in late spring had the highest lifetime risk of developing depression. Similar results were observed by Torrey et al. [9] in their studies on an American population conducted in the mid-1990s, and by Joiner et al. [10], who examined the risk of depression in Australia. In studies in a British population, Solib et al. [11] analyzed the link between the month of birth and the risk of a suicide attempt. People who committed suicide were significantly more likely to have been born between April and June, and this association was strongest in women. Mino et al. [12] reported that patients in Japan treated due to mood disorders (N=13.969) were more likely to have been born in winter and early spring. Björkstén and Bjerregaard [13] found that among the inhabitants of Greenland born in the years 1961–1980 and raised in Western culture, the risk of committing suicide was the highest in those born between March and June, but this association was not found among people born from 1903 to 1950 and raised in a non-Western, traditional manner.

Various studies have focused on the importance of birth month in the regulation of circadian rhythm cycles [14], the process of character and personality traits shaping [15,16], and even the occurrence of obesity in adult life [17]. Moreover, the link between the season of birth, fertility, and numerous somatic diseases has been described [18]. After analyzing the results of a multicenter trial (almost 2 million examined individuals), Boland et al. [18] indicated the existence of such a correlation in the case of 55 diseases. This phenomenon may also be observed in the population of people who are not treated at present or were not treated in the past for mental or somatic disorders [19,20].

The aim of this study was to determine whether the specific season of the year in which the first trimester of pregnancy took place is significantly associated with the course (intensification and frequency of occurrence) of an episode of recurrent depressive disorders in adult life.

Material and Methods

Material

We enrolled 184 people (ages 17–67 years, mean age (*M)*=45.49, *SD*=11.91) treated for recurrent depressive disorders. The criteria for inclusion in the study were based on the diagnostic criteria for an episode of depression and recurrent depressive disorders in accordance with the ICD-10 guidelines (F32.0–7.32.2, F33.0–F33.8) [21].

The patients took part in the study during hospitalization. Participation in the study did not affect the applied treatment modalities (pharmacotherapy and psychotherapy). The people with a history confirming the occurrence in the past of mental disorders other than depressive episodes, somatic diseases that may potentially have an impact on the course of a depressive episode, and the people who did not give voluntary written informed consent to participate in the experiment, were excluded from the study. The patients were treated with standard antidepressant pharmacotherapy using drugs from the group of selective serotonin reuptake inhibitors (SSRIs) [22].

Qualification for participation in the experiment was performed at random without replacement sampling. Only people for whom the interview confirmed uncomplicated pregnancy and labor were qualified for the study. Pregnancy lasting from 38 to 42 weeks was considered normal, and the average pregnancy duration was 40 weeks. The seasons in which subsequent pregnancy trimesters took place were determined based on that.

Methods

The Hamilton Depression Rating Scale [HDRS, HAM-D), developed by M. Hamilton in 1960, was used to evaluate the dynamics of intensification of recurrent depressive disorder symptoms. Cronbach's alpha calculated for this scale totals 0.70 on average; the sensitivity coefficient is 0.78, and the test relevance coefficient is 0.75 [23]. A scoring system developed by Demyttenaere and De Fruyt [24] was applied when analyzing the intensity of depressive episode symptoms.

Furthermore, the CIDI questionnaire (version 3.0) was used in the experiment. This tool is based on the diagnostic criteria of the ICD-10 and DSM-IV classifications, and is recommended by WHO and WMH for use in epidemiological studies on psychiatry. It enables the estimation of mental disorders dissemination as well as the evaluation of their advancement and the subjective burden of the disease [25].

In each case, an evaluation of the mental state and depressive disorder symptoms intensification was conducted by the

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same person, who was a specialist in clinical psychology. The CIDI questionnaire was used at the stage of qualifying patients to participate in the study. An examination based on the application of the HDRS scale was performed twice: once on the day of qualification of a specific person to the experiment, and once after clinical condition improvement (after 8 weeks of treatment, on average).

All the patients qualified for the study were unrelated native Poles from central Poland. Participation in the experiment was voluntary. The respondents made a decision to participate in the study after they had been informed of the purpose and were assured that their participation was voluntary, and the personal details and results of the tests conducted would not be distributed, but used only and exclusively in general comparisons. Each patient gave written consent to participate in the experiment in accordance with the report approved by the Bioethics Committee of the Medical University of Łódź (approval no. RNN/534/10/KB of 07/09/2010).

Statistical analysis of results

Selected methods of descriptive statistics and methods of statistical reasoning were used in the statistical analysis of the collected material. During a statistical verification of the hypotheses, a two-tailed critical area was assumed.

Appropriate structural indicators (i.e., prevalence of a given trait expressed as percentage) were applied in the description of qualitative features in the examined group of affected patients and the control group. Arithmetic mean (M) was calculated to describe the value of average quantitative features. The scope of values (with the minimum and maximum value determined) and standard deviation (SD) were used as measures of dispersion.

The character of distribution of all variables was examined using the Shapiro-Wilk test. The hypothesis on the normality of distribution was rejected. The following non-parametric tests were used for non-parametric variables for statistical comparisons between the examined groups: Pearson's chi-squared test and the Mann-Whitney U test. The level of statistical significance was set at $p<0.05$ [26]. All statistical calculations were conducted using STATISTICA PL, version 12.

Results

The social and demographic characteristics of the studied group and the information regarding the course of the underlying disease are presented in Table 1.

Table 1. Characteristics of the studied group in terms of demographic features and the course of the disease (*N*=184).

Age (years)	
M (SD)	M=45.49 (SD=11.91)
Women/men	
n (%)	112/72 (60.87/39.13)
HDRS-I	
M (SD)	M=21.65 (SD=7.12)
HDRS-II	
M (SD)	M=5.89 (SD=4.17)
Number of depressive episodes	
M (SD)	M=4.05 (SD=2.86)
Duration of disease (years)	
M (SD)	M=5.06 (SD=2.53)

HDRS I – Hamilton Depression Rating Scale on the day of qualification for the experiment; HDRS II – Hamilton Depression Rating Scale after response to the pharmacological treatment applied.

Table 2 presents the characteristics of birth frequency of the examined individuals in specific seasons of the year. The most numerous group were the patients born in spring and summer. No statistically significant differences between birth season and birth half-year and the frequency of occurrence of an episode of depression were found.

During the subsequent stage of the analysis, we analyzed the relationship between the birth season of a patient and the intensification of depression symptoms measured using the HDRS scale. The results of this analysis are shown in Table 3, indicating that differences in the intensity of depressive disorders between people born in different seasons were not statistically significant. However, the analysis of the results obtained indicates that the greatest number of people suffering from a major episode of depression were born between April and September. Accepting the assumption regarding the duration of pregnancy made at the beginning of the analysis, it is possible to calculate that the first trimester of pregnancy in the people suffering from a major depressive episode occurred between October and March.

Discussion

The literature on the correlation between birth season and frequency of occurrence and course of recurrent depressive disorders is sparse. Owing to the size of the studied group and the nature of the population (inhabitants of Central Europe), the conclusions formulated on this basis in the present article may not be generalizable. However, there are other reports in the literature that confirm the tendencies observed.

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Table 2. Birth frequency in specific quarters of the year for the examined group (*N*=184).

Birth quarter	n (%)	HDRS I M (SD)	HDRS II M (SD)
1st quarter January–March	46 (25%)	22.72 (6.91)	6.22 (4.85)
2nd quarter April–June	48 (26%)	22.01 (6.84)	6.07 (4.36)
3rd quarter July–September	53 (28%)	20.79 (6.19)	5.45 (3.81)
4th quarter October-December	37 (21%)	21.08 (5.59)	5.89 (3.52)
1st half-year	93 (50.5%)	22.39 (6.87)	6.16 (4.61)
2nd half-year	91 (49.5%)	20.89 (5.89)	5.61 (3.66)
Mann-Whitney U test		p=0.192	p=0.421

HDRS I – Hamilton Depression Rating Scale on the day of qualification for the experiment; HDRS II – Hamilton Depression Rating Scale after response to the pharmacological treatment applied.

Table 3. Birth quarter versus intensification of depression symptoms measured using the HDRS scale.

HDRS I N=184	1st quarter January–March	2nd quarter April–June	3rd quarter July–September	4th quarter October–December	Pearson's chi-squared test
8–12 mild intensification of depressive disorder symptoms	4	5	6	3	*p*=0.292
13–17 moderate intensification of depressive disorder symptoms	7	6	10	8	
18–29 heavy intensification of depressive disorder symptoms	28 (24.35%)	30 (26.09%)	33 (28.71%)	24 (20.87)	
>30 extreme intensification of depressive disorder symptoms	7	6	3	2	
HDRS II N=179	**1st quarter January–March**	**2nd quarter April–June**	**3rd quarter July–September**	**4th quarter October–December**	**Pearson's chi-squared test**
>7 no symptoms of depressive disorders	29	33	38	25	*p*=0.655
8–12 mild intensification of depressive disorder symptoms	10	9	9	9	
13–17 moderate intensification of depressive disorder symptoms	5	3	4	2	
18–29 heavy intensification of depressive disorder symptoms	2	1	0	0	

HDRS I – Hamilton Depression Rating Scale on the day of qualification for the experiment; HDRS II – Hamilton Depression Rating Scale after response to the pharmacological treatment applied.

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Similar observations were described by Park et al. [27], who examined 891 patients from South Korea treated for unipolar non-psychotic major depressive disorders (MDD). The patients were divided into 2 groups: those born in spring/summer (n=457) and those born in autumn/winter (n=434). These 2 groups did not differ significantly in clinical course of disease, but those born in the spring and summer tended to have a worse prognosis. Among those born in the spring or summer, the first episode of the disease occurred significantly earlier in life and they had worse deficits in concentration and self-control.

In the work by Fountoulakis et al. [28], patients treated for depressive disorders did not differ significantly from healthy subjects in terms of the frequency of birth in subsequent seasons. However, people born in the spring had higher results on the Hamilton Depression Rating Scale during disease recurrence. Joiner et al. [29] emphasized that people born between September and November in the southern hemisphere, and between March and May in the northern hemisphere, were characterized by greater intensification of depression symptoms and an elevated risk of suicide-related behaviors.

When presenting results of their studies, Henriksson et al. [30] reported that postpartum depression symptoms at 6 weeks after labor were observed more often in women who gave birth between October and December compared to women who gave birth between April and June. The same pattern of symptoms was observed in women who before getting pregnant underwent antidepression therapy due to the presence of depression symptoms; access to daylight and vitamin D insufficiency may be particularly important factors in this case [31]. Bauer et al. [32] found that in bipolar affective disorder, greater availability of sunlight (access to natural sunlight) during the first 3 months of life was associated with delayed onset of the first symptoms of disease. On the other hand, Pjrek et al. [33] indicated specific habits of parents during early stages of a child's development, depending on the season of the year when the child was born. This relationship is a separate problem we intend to address in our subsequent papers.

Dysregulation of the immune system, as an etiological factor that also affects the course of depression, no longer raises any doubt [34]. Using the expression 'emotional immunity', D'Acquisto [35] reported that the immune system and the affective system are both dynamic systems, which undergo constant changes and are a mirror reflection of one another. Among the factors that may be of importance for the occurrence of the phenomenon described by us, it is appropriate to pay attention to an increased risk of viral and bacterial infections during the autumn and winter seasons in our climatic zone. They may be conducive to the emergence of depression symptoms in adulthood, irrespective of the moment when an infectious factor was active. Infections during both the prenatal period [36,37] and early childhood are important as they affect the functional dynamics of mutual relationships between the frontal lobes and the limbic system [38]. Furthermore, infections affecting patients at subsequent stages of life are equally important [39,40].

We are facing a two-sided dependence. A depressive episode is linked with the dysregulation of the immune system, yet primal immunological deterioration of the organism – through sickness behavior and somatic comorbidity – is also conducive to the development of depression [41]., Henríquez-Sánchez et al. [42] paid attention to such factors significant for the development of the disease as: the amount of daylight, average daily temperature, or average daily precipitation. On the other hand, Marques et al. [43] and Vohr et al. [44] reported that a mother's restricted access to nutrient-rich foods during pregnancy may be also important. Correct nutritional ingredients are of high significance for the proper development of the immune system of the fetus [45].

To sum up, it is important to approach the results presented herein with caution. We definitely should not formulate any "health-related horoscopes" for Central Europe inhabitants based on them. Nevertheless, these data are compatible with the results of studies conducted at other scientific centers and indicate a series of factors that may be of importance in the etiology of depressive disorders, such as climatic conditions, risk of infections, and availability of sunlight. Undoubtedly, this issue requires further investigations. The results presented in this article serve as a confirmation for the assumptions of the neurodevelopmental theory of depression, which indicates that the prenatal period has an impact on the prevalence of depression in adult life [46].

Conclusions

1. Birth month may be significant for the course of recurrent depressive disorders.
2. In the case of patients from Central Europe, the first trimester of pregnancy occurring in autumn and winter months seems to be of importance. The results recorded need to be approached with caution due to the small size of the examined group.

Conflict of interest

None.

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