

The Relationship of Deficit Syndrome with Clinical Symptoms, Summer Births and Heritability in Patients with Schizophrenia



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SUMMARY

Aim: The aim of this study was to compare deficit schizophrenia patients with non-deficit schizophrenia patients for negative and positive symptom scores, rate of summer births, and rate of familial history of psychosis.

Method: One hundred ten patients with schizophrenia, diagnosed via Structured Clinical Interview for DSM-IV (SCID-I), and aged between 18-65 were included in the study. Sociodemographic information was obtained for all the patients, followed by evaluations using the Scale for the Assessment of Negative Symptoms (SANS), Scale for the Assessment of Positive Symptoms (SAPS), and the Schedule for the Deficit Syndrome (SDS).

Results: The deficit syndrome group had higher negative and positive scores compared to the non-deficit group. The rate of summer births was higher in the deficit group. Although the rate of positive family history for psychosis was higher in the deficit group compared with the non-deficit group, the difference did not achieve statistical significance.

Conclusion: Our results depict higher severity of negative and positive symptom scores and higher rate of summer births in patients with deficit schizophrenia. These data provide more evidence that deficit and non-deficit schizophrenia are different subtypes having different pathophysiologies. However, statistically nonsignificant difference between the two groups with regard to positive familial history suggests that the thesis of deficit schizophrenia may be related to genetic factors rather than environmental factors. Further investigation into these findings are needed to determine the genetic relationship.

Keywords: Schizophrenia, deficit syndrome, seasons, family.

INTRODUCTION

Schizophrenia is conceptualized as a syndrome that includes different diseases caused by different pathological processes, despite the common clinical features observed. One way to differentiate and define the diseases included in the syndrome is to determine homogeneous sub groups. A widely used and accepted approach to form sub groups is to classify schizophrenia patients as “deficit syndrome” and “non-deficit syndrome” (Carpenter et al. 1988).

Previous reports determined that negative symptoms were more prominent in patients with deficit syndrome compared to patients with non-deficit schizophrenia (Tiryaki et al. 2003, Wang et al. 2008). Moreover, neurological impairments (Buchanan et al. 1990), and emotional deficits (Arango et al. 2000) were observed more in patients with deficit syndrome. On the other hand, psychotic symptoms, depressive affect, anxiety, feelings of guilt and hostility, suicide risk, and substance dependency were shown to be more frequent in patients with non-deficit schizophrenia (Kirkpatrick et al. 1993,

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Kirkpatrick et al. 1996, Subotnik et al. 2000). Patients with deficit schizophrenia usually have a history of low premorbid adjustment and premorbid cognitive deficits (Galderisi et al. 2002). Longitudinal studies demonstrated that quality of life, social adjustment, occupational functioning (Tek et al. 2001), social functioning (Ekinici et al. 2012), insight (Köşger et al. 2014), rates of remission (Strauss et al. 2010), and treatment response (Kopelowicz et al. 2000) of patients with deficit schizophrenia were poorer compared to patients with non-deficit schizophrenia. Deficit schizophrenia has been shown to occur more frequent in males (Roy et al. 2001). A study determined that patients with deficit schizophrenia had less grey matter volume in some of the brain regions compared to patients with non-deficit schizophrenia (Özdemir et al. 2012). Another study that investigated the association between orbito-frontal, pre-frontal, and temporal brain regions detected impairments in this region, in patients with deficit schizophrenia (Kitiş et al. 2012).

Another area of focus has been to compare deficit and non-deficit schizophrenia with regard to the frequency of schizophrenia in the patient's family. It has been detected that the rate of schizophrenia was significantly higher among relatives of patients with deficit schizophrenia (Kirkpatrick et al. 2000a). In addition, social withdrawal (Kirkpatrick et al. 2001), clinically non-significant negative symptoms (Hong et al. 2003), and impairments in executive functions (Scala et al. 2014) were observed to be more frequent in relatives of those patients. Collectively, these findings provide evidence that heritability may have an important role in deficit schizophrenia. Quite the contrary, some studies showed no significant difference in the rate of schizophrenia in relatives of deficit schizophrenia patients compared to relatives of the non-deficit group (Scala et al. 2014). Other studies did not show any relationship between genetic heritability and deficit syndrome (Wonodi et al. 2006, Bienkowski et al. 2015).

Interestingly, the rate of summer births has been observed to be higher among patients with deficit schizophrenia (Kirkpatrick et al. 1998, Tek et al. 2001, Kirkpatrick et al. 2002, Bralet et al. 2002, Messiah et al. 2004, Kallel et al. 2007). Despite this finding, the rate of winter births has been shown to be higher among patients with schizophrenia overall. Thus, the association of seasonal factors in the pathogenesis of schizophrenia (Torrey et al. 1997, Schwartz 2011) has become a mainstay. Previous research showed that among schizophrenia patients who were born in winter, the paranoid subtype was more frequent (Hsieh et al. 1987), and the overall clinical course was better (Boyd et al. 1986). These findings can be taken as an evidence for the association of winter births with non-deficit, and the association of summer births with deficit schizophrenia. However, some studies did not find any difference between patients with deficit and non-deficit schizophrenia with regard to season of birth (Dollfus et

al. 1999). Interestingly, no such strong relationship was found between deficit schizophrenia and summer births in studies conducted in southern hemisphere (McGrath ve Welham 1999, Welham et al. 2006).

Another approach came from studies that investigated factors related to season of birth and the etiology of schizophrenia. In most of the studies that examined the influence of climate, no relationship between the weather temperatures and season of birth was found (Torrey ve Torrey 1979, Ede et al. 1985). No differences were found between people who were born in hot or cool summers (McNeil et al. 1975), or between people who were born in cold or warm winters (Watson et al. 1984) with regard to frequency of schizophrenia. Some relationship has been detected between the higher rates of infectious diseases in winters (McGrath et al. 2002, Arias et al. 2012), seasonal feeding patterns (McGrath et al. 2003), and schizophrenia. Nevertheless, the findings of these studies are not adequate to make a conclusion (Tochigi et al. 2004).

After thirteen years of the development of the concept, Kirkpatrick and Buchanan (2001) published an article claiming that deficit schizophrenia and non-deficit schizophrenia are different diseases. Kirkpatrick and Galderisi (2008), as well as Galderisi and Maj (2009) detected that the two groups showed differences in five features: 1-symptoms and signs, 2-illness course, 3-pathophysiological features, 4-risk factors and etiological factors, and 5-treatment response. Therefore, deficit schizophrenia has been thought to be a more serious form of the illness, as patients in this group had lower quality of life and poorer functioning. However, the deficit syndrome group was closer to the healthy controls than non-deficit group (Buchanan ve ark 1993), and the deficit and non-deficit groups were not significantly different from each other (Galderisi et al. 2002) in some studies.

In this study, we aimed to compare patients with deficit and non-deficit schizophrenia with regard to clinical features, season of birth, and history of schizophrenia in relatives. We hypothesized that negative symptoms, summer births, and positive history of psychosis in relatives would be higher in patients with deficit schizophrenia compared to patients with non-deficit schizophrenia.

METHODS

The research was approved by the ethical committee of İzmir Atatürk Education and Research Hospital. All inpatients or outpatients aged between 18 and 65 who were diagnosed as schizophrenia between May 2005 and December 2006 were evaluated for the study. One hundred patients whose diagnosis were approved via SCID-I, who did not have mental retardation, organic brain illness, alcohol/substance dependence,

or abuse were included in the study. All the patients provided written informed consent to participate in the study.

Instruments

Patients were given a sociodemographic information form, Scale for the Assessment of Negative Symptoms (SANS), Scale for the Assessment of Positive Symptoms (SAPS), and the Schedule for the Deficit Syndrome: (SDS).

The sociodemographic information form contained questions to evaluate the age, season of birth, educational level, occupational status, marital status, age at marriage, age at illness onset, duration of illness, duration of treatment, history of schizophrenia in first and second degree relatives, birth complications, still birth or abortion history of the mother, and number of previous hospitalizations.

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) was developed by First et al. (1996) and adapted into Turkish by Ozkurkcigil et al. (1999).

Scale for the Assessment of Negative Symptoms (SANS) evaluates the level, distribution, and severity of negative symptoms of schizophrenia. It contains five subscales and twenty-five items. The five subscales are affective blunting, alogia, apathy, anhedonia and attention deficit respectively. It was developed by Andreasen (1990), and adapted into Turkish by Erkoç et al. (1991a).

Scale for the Assessment of Positive Symptoms (SAPS) evaluates the level, distribution, and severity of positive symptoms of schizophrenia. It consists of four subscales and thirty-four items. The subscales are hallucinations, delusions, bizarre behavior, and formal thought disorders respectively. It was developed by Andreasen (1990), and adapted into Turkish by Erkoç et al. (1991b).

The Schedule for the Deficit Syndrome (SDS) was developed as a diagnostic instrument, rather than a scale. During the evaluation patients, family members and even the physicians of the patients could be interviewed. The attention of focus is the long term illness course, rather than illness periods. The basic areas of psychopathology are taken into account along with occupational and social functioning, and open ended questions are used to evaluate functioning. It was developed by Kirkpatrick et al. (1989) and adapted into Turkish by Çıtak et al. (2006).

Statistics

The patients were evaluated with SDS to differentiate patients with deficit and non-deficit schizophrenia. Patients with deficit and non-deficit schizophrenia were compared via chi-square test for gender, season of birth, place of birth, features about labor, family history of psychosis. The two patient

groups were compared for birth complications using Fisher test, as some of the observed values were less than 5.

Patients with deficit and non-deficit schizophrenia were compared via independent sample t-test for age, level of education, age at illness onset, duration of treatment, number of previous hospitalizations, and scale scores. The statistical significance level was set to a p-value of less than 0.05 for all tests.

RESULTS

In the deficit syndrome group, 57.7% were male, whereas the non-deficit group contained 56.4% male. Most of the patients (64.5%) did not have deficit syndrome. Patients born in summer made up 34.5% of the group, while patients born in winter consisted of 65.5%. The ratio of the patients who were born in winter-spring were significantly higher in non-deficit syndrome group (73.2%), compared with the deficit syndrome group (51.0%) ($\chi^2=5.37$, $p=0.035$).

In the deficit syndrome group, 12 (30.8%) of the patients were born in villages, and 27 (69.2%) of them were born in towns-cities. In non-deficit syndrome group, 22 (31.0%) of the patients were born in villages, and 49 (69.0%) were born in towns-cities. There were no significant differences between the two groups.

In the deficit syndrome group, 20 (51.3%) of the patients were born in healthcare institutions, while 19 (48.7%) were born at home. In the non-deficit syndrome group, 30 (43.6%) patients were born in health care institutions, and 41 (56.4%) were born at home. There were no significant differences between the two groups.

There was a history of birth complications in 5 (12.8%) of the patients with deficit syndrome, and in 3 (4.2%) of the patients with non-deficit syndrome. There was no significant difference between the two groups.

There was a positive history of familial psychosis in 6 (15.4%) of the patients with deficit syndrome, and in 9 (12.7%) of the patients with non-deficit syndrome. There was no significant difference between the two groups.

The comparison of the patients with deficit and non-deficit schizophrenia for gender distribution and features about birth is depicted in table 1.

When patients with deficit and non-deficit schizophrenia were compared for age, education level, age at illness onset, duration of treatment, and number of hospitalizations, no statistically significant differences were observed between the two groups. The SANS and SAPS scores of patients with deficit syndrome were significantly higher than the patients with non-deficit syndrome (table 2).

Table 1. The comparison of patients with deficit and non-deficit syndrome for gender distribution, features about birth, familial history for psychosis

		Patients with deficit syndrome (n=39)		Patients with non-deficit syndrome (n=71)		χ
		n	%	n	%	
gender	female	17	42.3	30	43.6	0.02
	male	22	57.7	41	56.4	
season of birth	summer	19	48.7	19	26.8	5.37*
	winter-spring	20	51.3	52	73.2	
location of birth	village	12	30.8	22	31.0	0.01
	town-city	27	69.2	49	69.0	
place of birth	health care institution	20	51.3	30	43.6	2.22
	home	19	48.7	41	56.4	
birth complications	yes	5	12.8	3	4.2	2.76
	no	34	87.2	68	95.8	
positive family history for psychosis	yes	6	15.4	9	12.7	3.11
	no	33	84.6	62	87.3	

*p<0.05

Table 2. The comparison of patients with deficit and non-deficit syndrome for age, educational level, age at illness onset, duration of treatment, number of hospitalizations, and scale scores

	Patients with deficit syndrome (n=39) mean±sd	Patients with non-deficit syndrome (n=71) mean±sd	t
Age	36.9±8.6	37.3±10.7	0.20
education level	6.7±4.1	7.9±4.2	1.61
age at illness onset	21.6±6.8	22.5±6.8	0.68
duration of treatment	12.4±8.4	13.1±9.1	0.38
no of hospitalizations	1.3±1.1	1.5±0.8	0.73
SAPS	26.9±13.9	19.9±9.2	-1.87*
SANS	79.5±13.8	38.2±18.1	-12.38***

*p<0.05, *** p<0.001

SAPS: Scale for the Assessment of Positive Symptoms

SANS: Scale for the Assessment of Negative Symptoms

DISCUSSION

In this study, the patients with deficit syndrome had significantly higher negative and positive symptom severity. The higher negative symptom severity is an expected result that is in line with the definition of deficit syndrome and literature. There are inconsistent findings about the severity of positive symptoms. Köşger et al. (2014) compared patients with deficit and non-deficit schizophrenia and found out that positive symptom severity was significantly higher in deficit syndrome. Galderisi et al. (2002) did not report any difference between the two groups in their big sample sized, multicenter study. Spalletta et al. (1997) and Tek et al. (2001) reported that there was no significant difference between the two groups with regard to positive symptom severity. Tiryaki et al. (2003) found a higher positive symptom severity in non-deficit syndrome patients, although the difference did not reach statistical significance.

In line with previous research (Kirkpatrick et al. 1998, Tek et al. 2001, Kirkpatrick et al. 2002, Bralet et al. 2002, Messiah et al. 2004, Kallel et al. 2007), we found that the rate of summer births were significantly higher in patients with deficit syndrome compared with patients with non-deficit syndrome.

There are two reasons why the rates of winter births are higher in patients with schizophrenia, despite the fact that the rate of summer births is higher in patients with deficit schizophrenia. First of all, the patients with deficit schizophrenia make just 15-20% of all patients with schizophrenia. Secondly, the patients with non-deficit schizophrenia differentiate more strongly towards winter births.

This differentiation emphasizes the idea of the two groups having different etiologies (Messiah et al. 2004). Among the possible etiological factors are more frequent infections and less sun shine exposure in the winter time (McGrath et al.

2002), and seasonal feeding habits (McGrath et al. 2003). Human Herpes Virus 2, Borna Disease Virus, and HERV-W are the viruses which are most frequently shown to have relationships with schizophrenia (Arias et al. 2012). Paranoid subtype being more frequent among schizophrenia patients born in winter (Hsieh et al. 1987), winter births being more frequent among patients without a family history for schizophrenia (D'Amato et al. 1991), and better prognosis in non-deficit syndrome patients (Boyd et al. 1986) suggest that there is more frequently a milder pathology which results from environmental factors specific to winter in patients with non-deficit schizophrenia.

On the other hand, research shows that heritability has a more important role (Dollfus et al. 1998, Kirkpatrick et al. 2000b, Kirkpatrick et al. 2001, Hong et al. 2003, Scala et al. 2014) in patients with deficit syndrome. However, some studies bring out conflicting findings (Dollfus et al. 1996, Wonodi et al. 2006, Bienkowski et al. 2015). Another possibility is that the second trimester infections that affect children born in the spring-summer months (Kirkpatrick et al. 2002). Dickerson et al. (2006) have higher positive cytomegalovirus serology in deficit syndrome patients compared with non-deficit syndrome patients. This finding supports the role of environmental factors in deficit syndrome. In our study, positive family history for schizophrenia was more frequent in deficit syndrome group compared with non-deficit syndrome group, although the difference did not reach statistical significance. Taken together, these findings suggest that genetic and environmental factors should be investigated more extensively.

Another interesting finding is the gender ratios in deficit and non-deficit syndrome patients. A meta-analysis that evaluated the findings of 23 studies showed that there were significantly more males in deficit syndrome group (Roy et al. 2001); although, most of the evaluated studies did not show statistical significance. The authors concluded that the individual studies lacked statistical power which the meta-analysis had after evaluating all the studies together. In our study, no significant difference was found between deficit and non-deficit syndrome groups with regard to gender distribution.

Today, we can see more clearly both the advantages that this concept provides to better understand schizophrenia and the weaknesses of the concept to explain the clinical features and etiology of schizophrenia. It can be said that the concept of "deficit syndrome" made one of the most important contributions in Emil Kraepelin's approach to re-define psychotic disorders classifying them in subgroups starting with "dementia praecox" and "manic depressive psychosis". Our findings support that the research is still far from finding out the clinical features and underlying pathology to differentiate deficit and non-deficit syndromes.

In this time point, negative symptoms of schizophrenia are being evaluated again, and the advantages of dimensional approach are being mentioned despite the power of categorical approach in line with the dimensional approach of DSM-V. Galderisi et al. (2013) examined the long term stability and the effects on functioning of categorical and dimensional approaches. They found that 82.4% of patients with deficit syndrome and 79.6% of patients with non-deficit syndrome remained in the same groups. Patients with deficit syndrome had more severe negative symptoms and more impaired social functioning than patients with non-deficit syndrome. When factor analysis was made with dimensional approach, "poor emotional expression" and "avolition" were the two factors that explained most of the variance. Therefore, the concept of "loss of willpower" that had been mentioned by Kraepelin and Bleuler and its central role in the pathology of schizophrenia was put forth through the help of research and statistical analysis (Foussias and Remington, 2010).

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