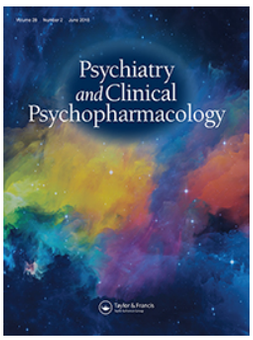

Psychiatry and Clinical Psychopharmacology

ISSN: 2475-0573 (Print) 2475-0581 (Online) Journal homepage: https://www.tandfonline.com/loi/tbcp21

Psychiatric disorders, developmental, and academic difficulties among children and adolescents at-risk for schizophrenia: a controlled study

Funda Gumustas, Emel Koyuncu Kutuk, Yasemin Yulaf & Behice Han Almis

To cite this article: Funda Gumustas, Emel Koyuncu Kutuk, Yasemin Yulaf & Behice Han Almis (2018) Psychiatric disorders, developmental, and academic difficulties among children and adolescents at-risk for schizophrenia: a controlled study, Psychiatry and Clinical Psychopharmacology, 28:2, 142-148, DOI: 10.1080/24750573.2017.1394803

To link to this article: https://doi.org/10.1080/24750573.2017.1394803

Published online: 31 Oct 2017.

PSYCHIATRY AND CLINICAL PSYCHOPHARMACOLOGY, 2018
VOL. 28, NO. 2, 142–148
https://doi.org/10.1080/24750573.2017.1394803

Taylor & Francis
Taylor & Francis Group

Psychiatric disorders, developmental, and academic difficulties among children and adolescents at-risk for schizophrenia: a controlled study

Funda Gumustas[a], Emel Koyuncu Kutuk[b], Yasemin Yulaf[c] and Behice Han Almis[d]

[a]Child and Adolescent Psychiatry Clinic, Marmara University Education Research Hospital, Istanbul, Turkey; [b]Psychiatry Clinic, Bartin State Hospital, Bartin, Turkey; [c]Psychology Department, Istanbul Gelisim University, Istanbul, Turkey; [d]Psychiatry Clinic, Adiyaman University Education Research Hospital, Adiyaman, Turkey

ABSTRACT

OBJECTIVE: The aim of this study was to determine whether there are differences in the presence of developmental delays, academic difficulties, and current mental disorders between offspring of parents with schizophrenia (High risk: HR) and offspring of parents with no mental illness (control group) up to the age of 16 years. The relationship of existing differences with psychosocial difficulties of having a parent with schizophrenia was evaluated.

METHOD: The sample of the study consisted of 35 HR and 30 control offspring aged 7–16 years. All parents were assessed using the SCID-I by a psychiatrist and offspring using the K-SADS-PL by a child psychiatrist. Information about the early developmental stages and academic difficulties of children were obtained through interviews with healthy parents. Emotional and behavioural problem levels of children were determined by the Strengths and Difficulties Questionnaire (SDQ), Swanson, Nolan, and Pelham-IV Questionnaire (SNAP-IV), the Screen for Child Anxiety Related Emotional Disorders (SCARED), and the Child Depression Inventory (CDI). All assessments were adjusted for socio-demographic variables.

RESULTS: The rates of generalized anxiety disorders, delayed walking, delayed speech and reading difficulties, the levels of conduct problems (CP), depression, and school phobia were significantly higher in HR offspring than in control. When adjusted for socio-demographic variables, the presence of delayed speech and reading difficulties and only CP levels continued to be significantly higher in HR group ($p < .05$). These differences were not associated with gender of ill parent, duration of parental illness, and hospitalization in affected group ($p > .05$).

CONCLUSION: Internalizing problems such as anxiety and depression are considered as a psychosocial result of having a schizophrenic parent. The higher rates of speech delay, reading difficulties, and CP level might be genetically associated with schizophrenia.

ARTICLE HISTORY
Received 30 August 2017
Accepted 16 October 2017

KEYWORDS
Schizophrenia; offspring; psychopathology; development; academic functioning

Introduction

Schizophrenia is a severe, and chronic psychiatric disorder with a high heritability rate [1]. A positive first-degree family history is the strongest risk factor for developing the disorder [2]. In the light of previous studies, we know that young adults with a parent with schizophrenia have increased risk for schizophrenia spectrum disorder and any other psychiatric disorder compared to young adults who have mentally healthy parents [3,4]. Because schizophrenia is considered as a life-long illness [5], it is important to know what psychiatric illnesses are seen before the psychotic disorder occurs in the high-risk (HR) group in childhood and adolescence, so that intervention programmes to prevent the emergence of psychotic disorders in high-risk children and adolescents can be developed. A few studies have examined which psychiatric diagnoses are more common in HR offspring under 20 years of age compared to offspring with mentally healthy parents [4,6–8]. But two of these studies also involve young people over 20 years of age at HR for the onset of schizophrenia [6,7]. Hans et al. [6] showed increased risk of current anxiety disorders but not lifetime diagnoses in adolescents (aged 12–22) of parents with schizophrenia. Elevated risks for a broad range of psychotic, affective, anxiety, personality disorders, and substance misuse in offspring (aged 14–28) of a parent with nonaffective schizophrenia in a population-based cohort study were found. A meta-analysis of family HR studies has been reported that while offspring (aged 20 and over) of parents with schizophrenia had significantly higher relative rates for schizophrenia, severe mental illness (schizophrenia or nonaffective psychosis, bipolar disorder (I or II), or major depressive disorder) and any mental disorder compared to offspring of parents with no severe mental illness, differences in diagnostic rates were not significant for offspring under 20 years

CONTACT Funda Gumustas fundagumustas@gmail.com Child and Adolescent Psychiatry Clinic, Marmara University Education Research Hospital, Muhsin Yazıcıoglu Street No: 10 Pendik, 34899 Istanbul, Turkey

of age [4]. HR children for schizophrenia have been found to have more attention deficit hyperactivity disorder (ADHD) in a comparative study of children aged 7–17 [8].

Schizophrenia is also hypothesized a neurodevelopmental disorder [9]. Children at HR for schizophrenia have more abnormalities in neurological and motor development from infancy through adolescence. These abnormalities may be seen in all offspring at HR for severe mental disorders; they are not specific to schizophrenia [10]. The cause of developmental delay in these children can be to grow in unfavourable family environment. In a study, it has been reported that children of mothers with schizophrenia spectrum disorders were more likely to show developmental delays and severe academic problems. Developmental delays have been shown to be associated with personality disorders and any psychiatric disorder in adulthood in the same study [11]. It is not clear which developmental problems are specific to schizophrenia and predicted future schizophrenia spectrum disorder.

By taking the hypothesis that children and adolescents of parents with schizophrenia have more developmental delays, academic difficulties, and current mental disorders, this study aims to investigate whether these differences will continue after socio-economic variables are adjusted and be associated with disease-related variables.

Method

The study was conducted in a child and adolescent psychiatry department in Turkey; the Training and Research Hospital of Adiyaman after obtaining approval from the Ethics Committee of Adiyaman University. The recruitment period was September 2012–March 2014.

Participants

Patients diagnosed with schizophrenia spectrum disorder who were followed in the community mental health centre and found to have at least one child between 7 and 16 years were asked to participate in the study. Children of parents with diagnosed schizophrenia were called HR group.

In terms of Mann–Whitney *U*-test, effect size is large (0.80), power 80%, and a priori sample estimates were 42 cases in total, including 21 cases in two groups.

Parents with no mental illness and their children who were admitted to the paediatric outpatient clinic of the hospital and who agreed to participate in the study constituted the control group (CG). Parents in the CG who had a personal or 1st degree family history of affective or schizophrenia spectrum disorders (n = 3), intellectual disability (n = 1), and severe neurological illness (n = 1) were excluded.

For both groups of children, cases were excluded who had an intellectual disability (n = 5), who had an unstable or chronic medical illness (n = 2), who had a history of head injury with loss of consciousness (n = 1), epilepsy (n = 3), and autistic spectrum disorder (n = 2). The study was carried out on 65 children and adolescents.

Before all participants were included in the study, written informed consent was provided by all parents and adolescents over 12 years of age; assent was sought in younger children.

Clinical evaluation and measures

The parental diagnoses of two groups were evaluated by using Structured Clinical Interview for DSM-IV Axis I Disorders (SCID) by a trained psychiatrist [12]. The duration of illness and hospitalization of affected parents and whether the illness was active or in recovery were also noted by the same psychiatrist. Mentally healthy parents of both two groups were asked to evaluate psychopathological symptoms in their children using the Strengths and Difficulties Questionnaire (SDQ) [13] and Swanson, Nolan, and Pelham-IV Questionnaire (SNAP-IV) [14]. Child psychiatrist received information from parents about their children's developmental stages during infancy (not walking at age 12 months, not speaking at age 2 years) and school achievement (age of learning reading, presence of letter mixing, incomplete reading, difficulty in reading comprehension, class repetition, school dropout).

A trained child psychiatrist who did not know the clinical diagnosis of parents examined children's psychopathology in a blinded manner by using the Schedule for Affective Disorders and Schizophrenia for School-Age Children – Present and Lifetime version (K-SADS-PL) [15]. All the children were asked to complete the Screen for Child Anxiety Related Emotional Disorders (SCARED) [16] to screen for DSM-IV childhood anxiety disorders and the Child Depression Inventory (CDI) [17].

According to the widely accepted definition of Duncan, Featherman, and Duncan (1972), the tripartite nature of socio-economic status (SES) includes parental income, parental education, and parental occupation [18]. SES was calculated on the basis of both parents' education levels and work status which are actually ordinal variables were accepted as dummy variables, treated as a continuous variable, and summed in our study.

Statistical analysis

The data were evaluated using the Statistical Package for the Social Sciences (version 20) programme. Descriptive statistics are shown as mean–standard

deviation or frequency (%). A 95% confidence interval was used to assess the data. The chi-square test was applied to categorical variables when comparing psychiatric diagnosis, developmental stages, and academic difficulties between two groups of children. OR values of all these variables were calculated by logistic regression analysis when adjusting for SES as a continuous variable and calculated by the Mantel–Haenszel Chi-Square test when controlling for categorical variables such as any psychiatric disorder, any developmental delay, any academic difficulties, gender of ill parent, and having active or remitted psychosis. Mann–Whitney *U*-test was used while evaluating SES, means for age, inattentiveness, hyperactivity, CP, anxiety, and depression scores. Socio-demographic variables were adjusted by one-way analysis of covariance. Significance was set at $p < .05$ and all p values were two-tailed.

Results

The socio-demographic variables, rate of current Axis I DSM-IV psychiatric disorders, developmental delays and academic difficulties of HR, and control offspring are shown in Table 1. Families with a schizophrenic parent had lower SES and more children than families with mentally healthy parents. With regard to psychopathology, generalized anxiety disorder (GAD) was a more prevalent disorder in the HR group. HR offspring had significantly higher rates of speech and walking delay and reading difficulty. After adjusting for socio-demographic variables, there were no significant differences in the rates of GAD and walking delay between groups, but the rates of speech delay and reading difficulties were still significantly higher in the HR group.

Rates of specific diagnoses, developmental delays, and academic difficulties were compared among groups after controlling for the presence of any diagnosis, any developmental delay, and any academic difficulty. The rate of GAD was significantly higher in the HR group after controlling for the presence of any disorder (Mantel–Haenszel OR = 4.66 (1.23–17.60), $p = .023$). The rate of speech delay was higher in the HR group after controlling for the presence of any developmental delay (Mantel–Haenszel OR = 7.33 (1.03–50.14), $p = .042$). But the higher rate of reading difficulty in the HR group did not continue after controlling for any academic difficulty (Mantel–Haenszel OR = 1.33 (0.10–16.48), $p = .82$).

The children in the HR group had higher conduct problems (CP) and school phobia values than the CG. After adjusting for socio-demographic variables, there was no significant difference in the school phobia scores between groups, but CP score was still significantly higher in the HR group (Table 2). CP score also remained stable after controlling for ADHD ($F = 4.73$, $R^2 = 0.05$, $p = .034$).

Forty-eight per cent ($n = 17$) of the parents who were diagnosed with schizophrenia were mothers and 52% ($n = 18$) were fathers. Paranoid schizophrenia was the subtype of 77.2% ($n = 27$) of the parents who were diagnosed with schizophrenia. The rate of schizoaffective disorder was 11.4% ($n = 4$), disorganized schizophrenia 5.7% ($n = 2$), and atypical psychosis 5.7% ($n = 2$). Eighty-one per cent ($n = 32$) of parents diagnosed with schizophrenia were in remission period, 9% ($n = 3$) were in the active phase of psychosis. Mean duration of illness was 18.94 ± 10.9 years (min. 2–max 30 years). The number of hospitalization was less than two in 40% ($n = 14$) of patients, and more than twice in 40% ($n = 14$). The remaining seven patients (20%) had no hospital admissions. The average duration of stay in hospital was 3.06 ± 3.15 months (min 0–max 12 months).

Variables such as gender of schizophrenic parent, duration of parental illness, and hospitalization were examined for association with CP score, speech delay, and reading difficulty in the HR group. As a result of the correlation analysis, the CP score had no significant correlation with duration of parental illness and hospitalization ($r = 0.23$, $p = .18$; $r = 0.19$, $p = .30$; respectively). There was no significant difference in the CP scores between offspring with schizophrenic mother and offspring with schizophrenic father ($z = 0.81$, $p = .46$; Mann–Whitney *U*-test). While 81% ($n = 13$) of offspring with schizophrenic mother had speech delay, 56% ($n = 9$) of offspring with schizophrenic father had ($\chi^2 = 2.32$, $p = .12$). There were no significant differences in the average duration of parental illness and hospitalization according to the presence of speech delay and reading difficulty ($z = 1.59$, $p = .11$; $z = 0.61$, $p = .54$; $z = 0.02$, $p = .98$; $z = 0.42$, $p = .67$; respectively). When we controlled the effects of fathers and mothers with either active or remitted psychotic disorders on the rates of GAD, any psychiatric disorders, speech delay, any developmental delay, reading difficulty, and any academic difficulty, there were no significant effects of these variables on offspring outcomes (Mantel–Haenszel adjusted ORs for all findings involve 1.0 and $p > .05$).

Discussion

In this study, we first aimed to examine whether rates of current psychiatric disorder, developmental delay, and academic difficulty showed differences between offspring of parents with schizophrenia spectrum disorder and mentally healthy. Our second aim was to determine whether socio-demographic variables had an effect on current psychiatric disorder, developmental delay, and academic difficulty. The third was to evaluate whether variables related to parental illness such as gender of ill parent, duration of illness, and hospitalization were associated with the problems

Table 1. Socio-demographic, clinical characteristics, developmental and academic difficulties of HR, and control offspring.

	HR Group $N = 35$ N (%)	Control group $N = 30$ N (%)	χ^2/Z	P	Odds ratio (95% CI) Adjusted[a]
Age (mean/sd)	12.4 (3.3)	11.9 (3.1)	0.59	0.55	
Sex: female,	17 (48.6)	18 (60)	0.84	0.35	
Number of children (mean/sd)	4.2 (2.1)	2.90 (1.1)	2.33	0.02*	
SES (mean/sd)	4.00 (1.2)	6.4 (1.8)	4.99	0.000***	
Any Axis I disorder	26 (76.5)	19 (63.3)	1.31	0.25	0.83 (0.18–3.72)
MDD	4 (11.8)	3 (10)	0.05	1.00	0.83 (0.17–4.06)
GAD	21 (61.8)	9 (30)	6.45	0.011*	0.40 (0.10–1.58)
SAD	4 (11.8)	4 (13.3)	0.03	1.00	0.57 (0.08–4.03)
Social phobia	2 (5.9)	1 (3.3)	1.82	1.00	0.55 (0.04–6.40)
ADHD	12 (35.3)	11 (36.7)	0.01	0.90	0.76 (0.19–3.02)
CD	3 (8.8)	1 (3.3)	0.82	0.61	0.35 (0.03–3.62)
Axis I comorbidity	12 (35.3)	7 (23.3)	1.09	0.29	2.89 (0.65–12.77)
Speech delay	22 (68.8)	6 (20)	14.85	0.000***	0.18 (0.04–0.80)*
Walking delay	17 (53.1)	5 (16.7)	8.99	0.003**	0.49 (0.11–2.23)
Reading difficulty	16 (48.5)	3 (10)	11.05	0.002**	0.10 (0.18–0.58)*
Class repetition	6 (17.6)	1 (3.3)	3.35	0.10	1.00 (0.06–15.74)
School dropout	3 (8.6)	1 (3.3)	2.69	0.60	2.81 (0.10–76.59)

Note: HR: high risk; SES: socio-economic status; MDD: major depressive disorder; GAD: generalized anxiety disorder; SAD: separation anxiety disorder; ADHD: attention deficit hyperactivity disorder; CD: conduct disorder.
[a]Adjusted for number of children and SES.
*$p < .05$.
**$p < .01$.
***$p < .001$.

that significantly higher than CG after adjusted for socio-demographic variables.

Our main results demonstrate that there were no significant differences between groups in terms of current psychiatric disorders except for GAD. But higher rate of GAD in the HR offspring did not continue after adjusted for SES and the number of children. Similar to our study, in a meta-analysis of family HR studies, it was shown that there was no significant difference between the offspring aged under 20 of schizophrenic and mentally healthy parents in the rate of psychiatric diagnosis [4]. Hans et al. [6] evaluated childhood and adolescent diagnoses in a sample of young people aged 12–22 who have a parent with schizophrenia, parent with other mental illness (major depressive disorder, bipolar, GAD, panic disorder, somatization disorder antisocial personality disorder, schizoid personality disorder, and posttraumatic stress disorder) and parent with no mental illness. In parallel with our study, they found a relationship between parent schizophrenia and offspring current anxiety disorder as well as schizophrenia spectrum disorders (schizophrenia, schizotypal personality, paranoid personality). Similarly, in a population-based cohort study, it was shown that elevated risks were found for a broad range of psychotic, affective, anxiety, personality disorders, and substance misuse in both offspring aged 14–28 who have a parent with nonaffective and affective schizophrenia compared to offspring of mentally healthy parents, but incidence rates for anxiety disorders did not show differences between adolescents who have parents diagnosed with schizophrenia spectrum and nonschizophrenic other mental disorders [7]. Maziade

Table 2. Comparison of emotional and behavioural scale scores between HR and CGs.

	High-risk group Median (IQR)	Control group Median (IQR)	Z (p) Unadjusted	F (p) Adjusted[a]
SDQ total	16.0 (11.0–19.0)	13.5 (9.0–20.0)	1.24 (0.21)	1.11 (0.29)
Prosocial behaviour	10.0 (5.0–10.0)	8.0 (5.5–10.0)	1.91 (0.05)	0.25 (0.61)
Conduct problems	3.0 (2.0–4.0)	2.0 (0.7–4.0)	2.29 (0.02)*	5.29 (0.02)*
Inattention-hyperactivity	4.0 (2.0–6.0)	4.0 (3.0–6.2)	1.17 (0.24)	0.14 (0.70)
Emotional symptoms	3.0 (1.0–5.0)	2.0 (0.0–5.0)	1.86 (0.06)	0.59 (0.44)
Peer problems	5.0 (4.0–6.0)	5.0 (4.0–6.0)	0.50 (0.61)	0.12 (0.72)
SCARED total	25.0 (6.0–44.0)	18.5 (2.0–35.0)	1.38 (0.16)	1.05 (0.31)
Somatic/panic	6.0 (1.0–12.0)	2.0 (0.0–10.5)	1.40 (0.15)	0.59 (0.44)
General anxiety	7.0 (0.0–11.0)	3.5 (0.0–11.0)	1.59 (0.11)	0.43 (0.51)
Separation anxiety	4.0 (0.0–11.0)	3.0 (0.0–8.0)	1.03 (0.30)	1.66 (0.20)
Social phobia	6.0 (1.0–9.0)	6.0 (1.0–7.0)	0.63 (0.52)	0.18 (0.66)
School phobia	2.0 (0.0–4.0)	1.0 (0.0–2.0)	3.22 (0.001)*	3.58 (0.06)
SNAP-IV total	0.8 (0.1–3.1)	1.2 (0.0–2.8)	0.45 (0.64)	0.002 (0.96)
Inattentiveness	0.3 (0.1–1.6)	0.5 (0.0–1.7)	0.01 (0.98)	0.07 (0.78)
Hyperactivity	0.4 (0.0–1.5)	0.5 (0.0–1.6)	0.86 (0.38)	0.09 (0.75)
CDI total	13.0 (3.0–22.0)	7.5 (1.0–16.2)	2.13 (0.03)*	0.002 (0.96)

Note: Z: Mann–Whitney U-test and F: One-way analyses of variance (ANOVA). SDQ: Strengths and Difficulties Questionnaire; SCARED: Screen for Child Anxiety Related Emotional Disorders; SNAP-IV: Swanson, Nolan, and Pelham, version IV scale–parent form; CDI: Child Depression Inventory.
[a]Adjusted for number of children and SES.
*$p < .05$.

et al. [19] compared the rates of psychiatric diagnoses between HR offspring for schizophrenia and bipolar disorder during adolescence, but there was no CG. They found both anxiety and disruptive behaviour disorder (DBD) in similar proportions in the two groups. Topal et al. [20] compared the rates of disruptive mood disorder between children of parents with unipolar depression, bipolar disorder, and no mental illness and did not find differences between groups. Keshavan et al. [21] showed that ADHD was the most common diagnosis in young schizophrenia offspring without comparison to the CG.

In two separate studies, the most common diagnoses were found as ADHD and any anxiety disorder in children aged up to 16 years with a schizophrenic parent without comparison with CG [22,23]. The study which compares the rates of psychiatric diagnosis between the HR offspring for schizophrenia and control offspring aged up to 17 years is limited. Sanchez-Gistau et al. [8] compared the rates of psychiatric disorders among offspring aged 7–17 of parents with schizophrenia, bipolar disorder, and without mental illness. They found that the rate of anxiety disorders was higher in HR offspring for schizophrenia than control and the rates of ADHD and DBD were higher in HR offspring for schizophrenia than HR offspring for bipolar disorder and CG. Like our study, when adjusting for SES, the higher prevalences of anxiety disorder and DBD in HR offspring for schizophrenia compared with control offspring was no longer significant, while ADHD continued to be more prevalent in HR offspring for bipolar disorder and schizophrenia relative to CG and they suggested that DBD may be related to social-disadvantage, while ADHD may be associated with genetic risk factors. In a large-scale nationwide family study, it was shown that the risk of bipolar disorder and schizophrenia increased in first-degree relatives of a proband group with ADHD and suggested that these disorders share genetic risk factors [24]. According to our results, GAD may be related to psychosocial difficulties of having a schizophrenic parent. There was no higher prevalence of ADHD than CG in our study. But it is valuable in terms of being one of the few comparative studies with CG which examines psychiatric diagnoses rates in offspring aged up to 16 years of parents with schizophrenia. There is a need for future large-sample study on this issue.

Although there were no diagnostically significant differences between the two groups, it was wondered whether there were any differences in terms of behavioural and emotional problem levels between the HR and CGs even when adjusted for socio-demographic variables at the early age. HR offspring had higher CP, depression, and school phobia scores than the CG. Only CP score continued to be significantly higher than control after adjusted for SES. De la Serna et al. [23] found similarly that only CP scores were significant higher in HR offspring than in control on SDQ. They also found significant differences in learning problems score between two groups on Conners Parent Rating Scale. But unlike our study, when the analysis was repeated controlling for ADHD, the significant differences of CP and learning problems were not found between two groups. In a study in our country which used neurocognitive tests, impairments in verbal fluency, executive functions, attention, and working memory were found [25]. McClellan et al. [26] showed that clinical HR adolescents demonstrated significant deficits in behavioural and academic functioning. Other studies were found that HR offspring had greater attentional difficulties and disruptive school behaviour which assessed in Conners Parent Rating Scale and SDQ and were proposed as predictive variables of schizophrenia [27,28]. It was suggested that externalizing disorders might mediate the development of major psychiatric disorders [29]. We also suggest that a higher level of CP may genetically associated with schizophrenia because it continued to be significantly higher in the HR group after adjusted for ADHD and SES.

We found significantly higher rates of delayed walking, delayed speech, and reading difficulty in the HR group than in the control, although the presence of class repetition and school dropout did not change across groups. Difference in delayed walking between groups did not continue after adjusted for SES. Higher rates of reading difficulty in the HR group did not continue after controlling for any academic difficulty. While two studies showed that offspring of parents with schizophrenia had significantly increased rates of delayed walking [30,31]. Niemi et al. [11] did not find significant differences in the per cent of delayed walking and speech across groups. Parental schizophrenia has been considered as a risk factor for atypical child development and adjustment [6,32]. Prospective longitudinal family HR studies suggest that low IQ, poor scholastic achievement, verbal ability during childhood are associated with later development of schizophrenia [33–35]. According to our study while walking delay was thought to be related with social disadvantages of HR offspring, speech delay might be genetically associated with schizophrenia. The inability to explain these differences across groups with disease-related variables such as parental sex, duration of illness, and hospitalization support our view. The interventions for verbal abilities may prevent future development of major psychiatric disorders in these children.

Having a small number of samples being obtained from interviews conducted with healthy parents with information about academic problems and developmental delays because it may cause recall and reporting bias are limitations of our study. The CDI and SCARED self-report scales used in our work may also

cause reporting bias. The cross-sectional nature of the study precludes the predictive value of our significant outcomes. Despite all these limitations, our findings are noteworthy with regard to give an idea that which problems we will encounter in HR children at an early age are related to psychosocial difficulties, which may be a genetic risk for developing later schizophrenia.

Conclusion

Children and adolescents aged 7–16 years before the age at risk for psychosis with a schizophrenic parent (HR offspring) did not differ in terms of psychiatric diagnosis rates from children with mentally healthy parents after adjusted for socio-demographic variables. These HR offspring had higher levels of CP without diagnosis of conduct disorder than the control offspring. Presence of developmental speech delay and reading difficulty were more common in HR offspring.

According to our study, while internalizing disorders such as anxiety and depression, developmental motor delay were thought to be related to socio-demographic variables, externalizing problems, developmental speech delay, and reading difficulty might be associated with schizophrenia regardless of the psychosocial variables. It is still unclear in the literature whether the clinical characteristics, as well as developmental and academic disadvantages in HR offspring will be specialized to have a schizophrenic parent or these problems can be seen in all children of parents with other serious mental illness. Longitudinal studies with large samples are needed to clarify this issue.

Acknowledgements

F.G. is involved with study concept and design, acquisition of the subjects and/or data, analysis and interpretation of the data, and preparation of the article. E.K.K. and Y.Y. dealt with selection of the patients into the study who met the inclusion criteria and interpretation of the discussion. B.H.A. is involved in preparation of the article, and revised the article critically for important intellectual content. All authors have approved the final version of the article.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

[1] Sullivan PF, Kendler KS, Neale MC. Schizophrenia as a complex trait. Arch Gen Psychiatr. 2003;60:1187–1192.
[2] Gottesman II, Laursen TM, Bertelsen A, et al. Severe mental disorders in offspring with 2 psychiatrically ill parents. Arch Gen Psychiatr. 2010;67:252–257.
[3] Erlenmeyer-Kimling L, Adamo UH, Rock D, et al. The New York high-risk project. Arch Gen Psychiatr. 1997;54:1096–1102.
[4] Rasic D, Hajek T, Alda M, et al. Risk of mental illness in offspring of parents with schizophrenia, bipolar disorder, and major depressive disorder: a metaanalysis of family high-risk studies. Schizophr Bull. 2014;40:28–38.
[5] Walker EF. Schizophrenia: a life-course developmental perspective. New York (NY): Academic Press; 1991.
[6] Hans SL, Auerbach JQ, Styr B, et al. Offspring of parents with schizophrenia: mental disorders during childhood and adolescence. Schizophr Bull. 2004;30:303–315.
[7] Dean K, Stevens H, Mortensen PB, et al. Full spectrum of psychiatric outcomes among offspring with parental history of mental disorder. Arch Gen Psychiatr. 2010;67:822–829.
[8] Sanchez-Gistau V, Romero S, Moreno D, et al. Psychiatric disorders in child and adolescent offspring of patients with schizophrenia and bipolar disorder: a controlled study. Schizophr Res. 2015;168:197–203.
[9] Weinberger D. From neuropathology to neurodevelopment. Lancet. 1995;346:552–557.
[10] Niemi LT, Suvisaari JM, Tuulio-Henriksson A, et al. Childhood developmental abnormalities in schizophrenia: evidence from high-risk studies. Schizophr Res. 2003;60:239–258.
[11] Niemi LT, Suvisaari JM, Haukka JK, et al. Childhood predictors of future psychiatric morbidity in offspring of mothers with psychotic disorder: results from the Helsinki High-Risk Study. Br J Psychiatr. 2005;186:108–114.
[12] First M, Spitzer R, Gibbon M, et al. Structured clinical interview for DSM-IV Axis I disorders, clinician version (SCID-CV). Washington (DC): American Psychiatric Press; 1997.
[13] Güvenir T, Özbek A, Baykara B, et al. Psychometric properties of the Turkish version of the Strengths and Difficulties Questionnaire (SDQ). Turk J Child Adolesc Ment Health. 2008;15:65–74.
[14] Bussing R, Fernandez M, Harwood M, et al. Parent and teacher SNAP-IV ratings of attention deficit hyperactivity disorder symptoms. Assessment. 2008;15:317–328.
[15] Kaufman J, Birmaher B, Brent D, et al. Schedule for affective disorders and schizophrenia for school-Age children-present and lifetime version (K-SADS-PL): initial reliability and validity data. J Am Acad Child Adolesc Psychiatr. 1997;36:980–988.
[16] Cakmakci F. Reliability and validity of the Turkish version of the screen for child anxiety related emotional disorders (SCARED) [Unpublished master's thesis]. Kocaeli: Kocaeli University, Faculty of Medicine, Department of Psychiatry; 2004.
[17] Öy B. Çocuklar İçin Depresyon Ölçeği: Geçerlilik ve güvenirlik çalışması. Turk Psikiyatri Derg. 1991;2:132–137.
[18] Sirin SR. Socioeconomic status and academic achievement: a meta-analytic review of research. Rev Educ Res. 2005;75(3):417–453.
[19] Maziade M, Gingras N, Rouleau N, et al. Clinical diagnoses in young offspring from eastern Quebec multigenerational families densely affected by schizophrenia or bipolar disorder. Acta Psychiatr Scand. 2008;117:118–126.
[20] Topal Z, Demir N, Tuman TC, et al. Rates of disruptive mood dysregulation disorder among adolescent offspring of parents with recurrent major depressive disorder versus those with bipolar disorder and matched

healthy controls. J Am Acad Child Adolesc Psychiatr. 2016;55(10S):S190.
[21] Keshavan M, Montrose DM, Rajarethinam R, et al. Psychopathology among offspring of parents with schizophrenia: relationship to premorbid impairments. Schizophr Res. 2008;103:114–120.
[22] Ross RG, Compagnon N. Diagnosis and treatment of psychiatric disorders in children with a schizophrenic parent. Schizophr Res. 2001;50:121–129.
[23] de la Serna E, Baeza I, Andres S, et al. Comparison between young siblings and offspring of subjects with schizophrenia: clinical and neuropsychological characteristics. Schizophr Res. 2011;131:35–42.
[24] Larsson H, Ryden E, Boman M, et al. Risk of bipolar disorder and schizophrenia in relatives of people with attention-deficit hyperactivity disorder. Br J Psychiatr. 2013;203:103–106.
[25] Ozan E, Deveci E, Oral M, et al. Neurocognitive functioning in a group of offspring genetically at high-risk for schizophrenia in Eastern Turkey. Brain Res Bull. 2010;82:218–223.
[26] McClellan J, Breiger D, McCurry C, et al. Premorbid functioning in early-onset psychotic disorders. J Am Acad Child Adolesc Psychiatr. 2003;42:666–672.
[27] Erlenmeyer-Kimling L, Cornblatt BA, Rock D, et al. The New York High-Risk Project: anhedonia, attentional deviance, and psychopathology. Schizophr Bull. 1993;19:141–153.
[28] Bearden CE, Rosso IM, Hollister JM, et al. A prospective cohort study of childhood behavioral deviance and language abnormalities as predictors of adult schizophrenia. Schizophr Bull. 2000;26:395–410.
[29] Krueger RF, Hicks BM, Patrick CJ, et al. Etiologic connections among substance dependence, antisocial behavior, and personality: modeling the externalizing spectrum. J Abnorm Psychol. 2002;111:411–424.
[30] Henriksson KM, McNeil TF. Health and development in the first 4 years of life in offspring of women with schizophrenia and affective psychoses: Well-Baby Clinic information. Schizophr Res. 2004;70:39–48.
[31] Burton BK, Hjorthoj J, Jepsen JR, et al. Research review: do motor deficits during development represent an endophenotype for schizophrenia? A meta-analysis. J Child Psychol Psychiatr. 2016;57:446–456.
[32] Johnstone EC, Ebmeier KP, Miller P, et al. Predicting schizophrenia: findings from the Edinburgh High-Risk Study. Br J Psychiatr. 2005;186:18–25.
[33] Erlenmeyer-Kimling L, Rock D, Roberts SA, et al. Attention, memory, and motor skills as childhood predictors of schizophrenia-related psychoses: The New York High-Risk Project. Am J Psychiatr. 2000; 157:1416–1422.
[34] Sorensen HJ, Mortensen EL, Parnas J, et al. Premorbid neurocognitive functioning in schizophrenia spectrum disorder. Schizophr Bull. 2005;32:578–583.
[35] Seidman LJ, Giuliano AJ, Meyer EC, et al. Neuropsychology of the prodrome to psychosis in the NAPLS Consortium: relationship to family history and conversion to psychosis. Arch Gen Psychiatr. 2010;67:578–588.