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Schizophrenia among young people first admitted to psychiatric inpatient care during early and middle adolescence

Timo Holttinen [a,*], Sami Pirkola [b], Riittakerttu Kaltiala [a,c]

[a] Tampere University Hospital, Department of Adolescent Psychiatry and Tampere University, Faculty of Medicine and Health Technology, Tampere, Finland
[b] Tampere University, Faculty of Social Sciences, Tampere, Finland
[c] Vanha Vaasa Hospital, Vaasa, Finland

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ABSTRACT

Objective: This study explored the incidence and stability of schizophrenia in a large national register data of all adolescents first admitted to psychiatric inpatient care at ages 13–17 in Finland 1980–2010.
Methods: The study population (N 17,112) comprised all Finnish citizens aged 13–17 receiving their first ever psychiatric inpatient treatment between 1980 and 2010 in Finland. To explore incidence and stability of schizophrenia, the diagnostic information on inpatient care or disability pension was obtained from the appropriate registers.
Results: The incidence of schizophrenia disorders (F20 + F25) during adolescence was higher in the study population for those admitted to psychiatric inpatient care 1980–1989 than in other decades examined. Overall, psychiatric inpatient care during adolescence was a risk factor for subsequent schizophrenia, especially if a diagnosis of F20–29 was set although a considerable share of those with psychotic disorders other than schizophrenia diagnosis did not subsequently convert to schizophrenia. The stability of adolescent onset schizophrenia diagnosis was high.
Conclusion: Adolescents requiring psychiatric inpatient care have a higher later rate of schizophrenia diagnosis than prevalence at community level. Whereas adolescent onset schizophrenia diagnosis is a fairly stable diagnosis, there are other adolescent psychotic disorders which are more transient in nature.

1. Introduction

Rapid physical and mental development in youth exposes adolescents to mental disorders that vastly increase in prevalence from childhood to adolescence (Clemmensen et al., 2012; Costello et al., 2011; Jones, 2013; Merikangas et al., 2009; Paus et al., 2008). Adolescent-onset mental disorders commonly continue or recur in adulthood (Fichter et al., 2009; Jones, 2013; Kim-Cohen et al., 2003) and a majority of adulthood psychiatric disorders have onset in adolescence (Kim-Cohen et al., 2003). The strongest homotypic continuity has been observed in schizophrenia and bipolar disorder (Chang et al., 2009; Fraguas et al., 2008). In other disorders heterotypic continuity is more common (Copeland et al., 2009; Ranøyen et al., 2018). Psychiatric comorbidity is moreover very common among adolescents, and a specific disorder may also present with multiform symptoms to the extent that it meets criteria for several other disorders (Angold et al., 1999; Ranøyen et al., 2018). Overall, the multiformity of early symptoms in adolescence makes it hard to distinguish the developmental pathways of different psychiatric disorders, and indeed almost all psychiatric disorders have been associated with subsequent schizophrenia diagnosis (Andersen et al., 2013).

Schizophrenia spectrum disorders are rare up to the age of 13 years but show a marked increase in prevalence between ages 15–17, with the peak age of onset between 15 and 30 years (Cannon et al., 1999; McClellan and Stock, 2013). Psychotic disorders in adolescents are diagnosed using the same criteria as in adults. However, there is symptom overlap between schizophrenia and other childhood psychiatric disorders and misdiagnoses are common in community settings (Hlastala and McClellan, 2005; McKenna et al., 1994; Werry et al., 1991). Differential diagnosis between very early onset schizophrenia and a mixture of developmental delays, mood lability and subclinical psychotic symptoms may be challenging (McKenna et al., 1994). Early

Abbreviations: SCH, schizophrenia.

* Corresponding author at: Tampere University, Faculty of Medicine and Health Technology, Arvo Ylpön katu 34, 33014 Tampere, Finland.
E-mail address: timo.holttinen@tuni.fi (T. Holttinen).

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onset psychoses have been suggested to be characterized by atypical features such as dominance and greater severity of primary negative symptoms, which may mask the more obvious psychotic symptoms (Ballageer et al., 2005; Tandon et al., 2009). Schizophrenia spectrum psychoses are usually preceded by a prodromal phase, when the patient's functional level declines but psychotic symptoms are not yet apparent (Häfner and Maurer, 2006). Kumra et al. (1998) also suggested that certain combinations of complex developmental disorders and transient psychotic symptoms may actually represent early-onset schizophrenia even if the strict diagnostic criteria of schizophrenia are not met. Finally, normative developmental changes are rapid and there are considerable developmental differences between individuals during adolescence, which poses further challenges to diagnostic assessment.

Early onset schizophrenia is assumed to be a stable disorder with poor outcome (Clemmensen et al., 2012; Hollis, 2000; Röpcke and Eggers, 2005; Schwarz et al., 2016). According to long-term follow-up studies, 80–90 % of adolescents diagnosed with schizophrenia have this diagnosis in adulthood (Fraguas et al., 2008; Hollis, 2000; Remberk et al., 2014; Röpcke and Eggers, 2005; Schwarz et al., 2016). However, there is reason to assume that both over- and underdiagnosis of schizophrenia occurs in adolescent patients. Clinicians may wish to avoid setting such a severe diagnosis in order to avoid stigma (Copeland et al., 2009), the true nature of the disorder may not be clear in the prodromal phase, and a presentation that appears severe with psychotic symptoms in an earlier phase of adolescence may also appear less severe as development progresses (Ballageer et al., 2005). On the other hand, adolescents displaying psychotic symptoms may not actually have a psychotic disorder as, although hallucinations or delusions are characteristic of schizophrenia spectrum psychoses, they may also be present in other illnesses, such as affective disorders, neurological conditions, acute intoxication and post-traumatic disorders, even in mentally healthy young people (Hlastala and McClellan, 2005; Yung et al., 2009) Isolated psychotic symptoms are reported more commonly in early than in late adolescence, and with increasing age these symptoms become increasingly predictive of diagnosable psychopathology (Kelleher et al., 2012). However, only some of people, even those with severe psychotic-like symptoms, proceed to an actual psychotic disorder (Correll et al., 2005; Yung et al., 2009) and only about a third of those with psychotic disorders develop schizophrenia (Castro-Fornieles et al., 2011; Chang et al., 2009; Conrad et al., 2016; Correll et al., 2005; Fraguas et al., 2008). Both under- and overdiagnosing of schizophrenia spectrum psychoses risks harm to patients. Underdiagnosing may impede efforts to alter the course of schizophrenia thereby leading to poorer outcome, while overdiagnosing may lead, for example, to unnecessary use of antipsychotic medication, which increases risk for harmful adverse reactions (Amminger et al., 2011; Millan et al., 2016; Sikich et al., 2008).

Over the decades there have been major changes and progress in the understanding of schizophrenia spectrum psychoses, their nosological classification, assessment and interventions, which may have been contributed to findings that overall outcome in early-onset schizophrenia has improved over time (Clemmensen et al., 2012; Xu et al., 2020). However, schizophrenia spectrum psychoses in adolescents have been less studied than in adults. Much of the research on early onset schizophrenia group psychoses is based on small and selected samples in highly specialized treatment centres (Frazier et al., 2007).

The aim of the present study was to explore the incidence and stability of schizophrenia in a large national register data of all those admitted for the first time to psychiatric inpatient care at ages 13–17 in Finland in the period 1980–2010. In more detail we set out to analyse

1) What is the incidence of schizophrenia during adolescence and has the incidence changed from the 1980s to the 2000s?
2) How stable is the diagnosis of schizophrenia in follow-up of 4–35 years?
3) What is the later incidence of schizophrenia among those first admitted at ages 13–17 due to psychiatric diagnoses other than schizophrenia, and has this changed over the decades?
4) Are there diagnoses that at age 13–17 are predictive of subsequent schizophrenia?

2. Methods

The study population comprises all Finnish citizens who between 1980 and 2010 had their first ever psychiatric inpatient treatment at ages 13–17 in Finland. For the present register-based study information on inpatient care in psychiatric hospital was obtained from the Patient Discharge Register (used between 1969 and 1993) and the Care Register for Health Care (from 1994).

At baseline the size of the study population was 17,112. Basic demographic information in different decades is presented in Fig. 1.

After the index admission the subjects were followed up in registers until the end of 2014. Information on subsequent psychiatric inpatient episodes was gathered from the above-mentioned registers and information on disability pensions from the pension register data of the Finnish Centre for Pensions for earnings-related pensions and the Social Insurance Institution of Finland for national pensions. The Finnish pension system consists, broadly, of two statutory schemes respectively providing national pensions and earnings-related pensions. A disability pension may be granted if an individual's ability to work has been impaired for at least one year due to illness, injury or handicap. The dates of death were retrieved from statistics maintained by Statistics Finland based on death certificate data and data on the deceased obtained from the Population Information System. Personal identity code was used to link inpatient care data to other registers. To protect individuals' privacy data was anonymized by Statistics Finland.

The study data contains diagnostic information from three versions of the International Classification of Diseases (ICD). The WHO conversion tables between ICD-8, ICD-9 and ICD-10 were used to recode ICD-8 and ICD-9 diagnoses as ICD-10 diagnoses (World Health Organization. Division of Mental Health, 1994). In the present study the broad definition of schizophrenia was used by combining schizophrenia with schizoaffective disorder as distinguishing between schizophrenia and schizoaffective disorder is often challenging (Frazier et al., 2007). Patients were deemed to have an SCH diagnoses if this appeared as the main diagnosis or among any side diagnoses. Age at the time of index inpatient care was categorized as early adolescence (13–14 years old) and middle adolescence (15–17 years old). The year of first admission to inpatient care was categorized at decade level (the categories being 1980–1989, 1990–1999 and 2000–2010).

2.1. Statistical analyses

To investigate the incidence of schizophrenia diagnoses in the study population during adolescence (13–17 years old) information on first inpatient care or inpatient care episode with schizophrenia diagnosis during adolescence and first disability pension with SCH before the index admission or during adolescence was obtained from the appropriate register data. Cross-tabulations with chi square statistics were used to investigate the incidence of SCH diagnosis and differences of incidence between sexes and age at first inpatient care. The incidence of schizophrenia in adolescence population (13-17 yrs) was then calculated for those who had been diagnosed with SCH during the years 1985, 1995 or 2005 by adding together incidence at baseline and until age 18. Information on the adolescence population for the corresponding years was gathered from Statistics Finland's population structure statistics.

The stability of SCH diagnosis in the study population was investigated in those for whom SCH was diagnosed in their first inpatient care period or who had been granted disability pensions before their first inpatient care period. For this the information on last inpatient care or disability pension (whichever was later) was obtained from the

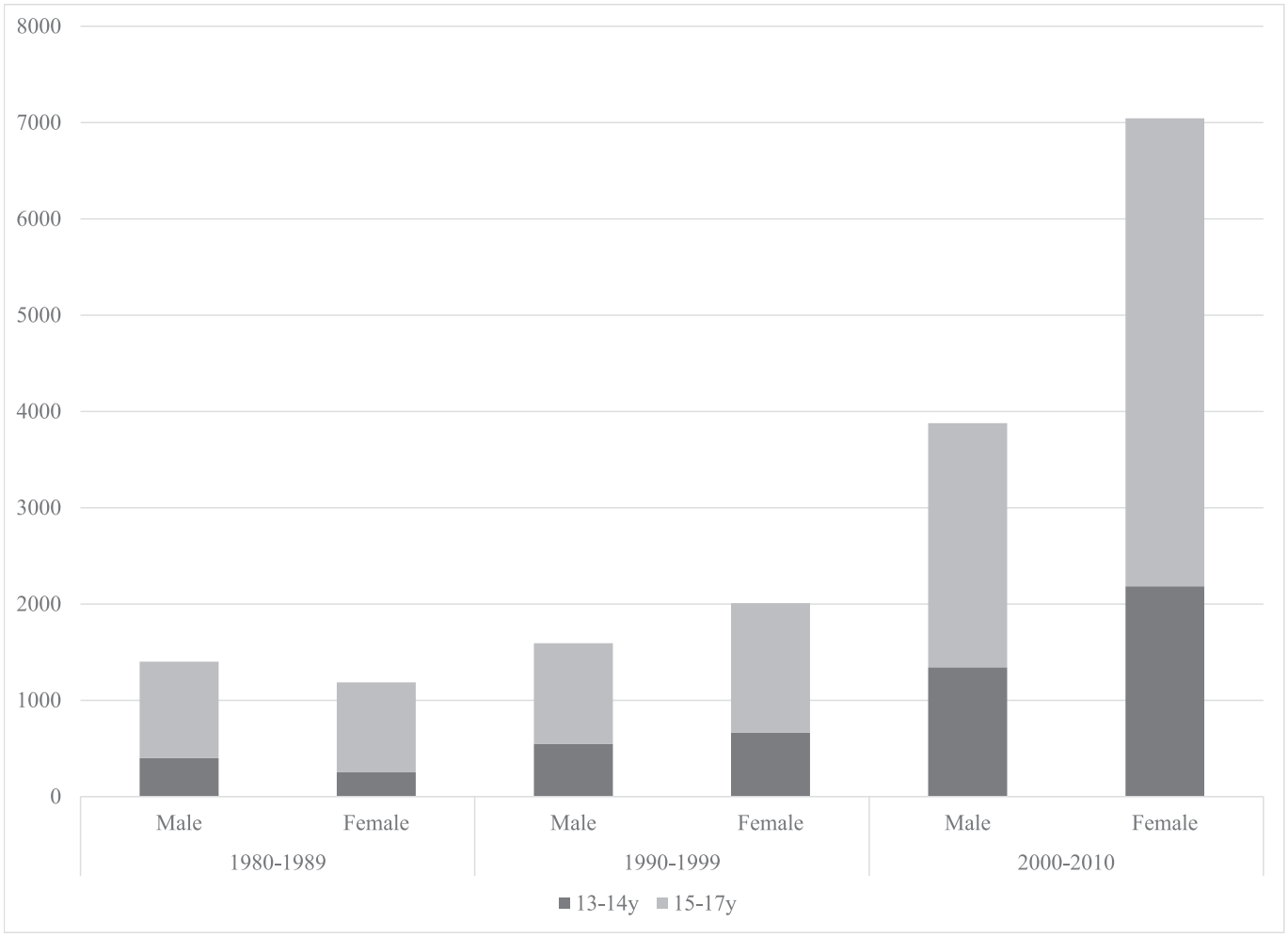

Fig. 1. Number of males and females in early and middle adolescent age groups.

appropriate register. Cross-tabulations with chi square statistics were used to investigate the stability of diagnoses and associations of sex and age at first inpatient care.

For the incidence of SCH diagnosis in follow-up for those with no SCH diagnosis at their first inpatient care period information on subsequent inpatient care or disability pension with SCH diagnosis was obtained from the appropriate register. For incidence in population of having psychiatric inpatient care in adolescence and subsequent SCH diagnosis, population level incidences were again calculated for first-time admission years 1985, 1995 and 2005 by adding baseline incidence to follow-up incidence.

For predictors for later SCH diagnosis cross-tabulations with chi square statistics were first used to investigate associations of sex, age at first inpatient care period, main diagnosis group with later incidence of SCH diagnosis. Because the subjects had different follow-up times, Cox regression analysis was then used to assess hazard ratios with 95 % confidence limits for first SCH diagnosis recorded as the reason for inpatient treatment or disability pension, whichever occurred earlier. For Cox regression analysis follow-up time was calculated from the discharge day of the index inpatient care period to the admission day to first inpatient care with SCH diagnosis or the first day of disability pension with SCH diagnosis, date of death or last possible follow-up day (31 December 2014) whichever was first. SCH diagnosis in inpatient care or disability pension data was defined as an event. Sex, categorized age, categorized admission year of first inpatient care period and main diagnosis group at index admission were used as covariates.

3. Results

3.1. Incidence of SCH during adolescence

The distribution of primary diagnoses in different decades is presented in Fig. 2.

Of the study population, 1.9 % (N 320 /17112) had a diagnosis of schizophrenia (ICD-10 diagnosis F20 or F25) at baseline either as first inpatient care diagnosis or disability pension diagnosis before the index inpatient care period. SCH diagnosis at baseline was more common among males (2.2 % (150/6873) than females 1.7 % (170/10239), p 0.015). SCH diagnosis at baseline was more common in the group of middle adolescents than in the early adolescent group (0.4 % (24/5396) of 13–14-year-olds, with 2.5 % (296/11,716) of 15–17-year-olds having SCH diagnosis, p 0.001). SCH diagnosis at baseline was more common among those who had first inpatient care in 1980–1989 (1980–1989: 7.5 % ($n = 194/2588$), 1990–1999: 1.2 % (44/3602), 2000–2010: 0.8 % (82/10,922)).

Further 1.4 % (242/16792) received SCH diagnosis after baseline but before age 18, 1.7 % (117/6723) of males and 1.2 % (125/10,069) ($p = 0.01$) of females. Also, later SCH diagnosis during adolescence was more common among those having first inpatient care in 1980–1989: 1980–1989 3.5 % (84/2394), 1990–1999: 1.7 % (64/3558), 2000–2010: 0.9 % (94/10,840) ($p < 0.001$). There was no statistically significant difference between those having first inpatient care in early adolescence or in middle adolescence.

The overall incidence of schizophrenia in adolescent population was

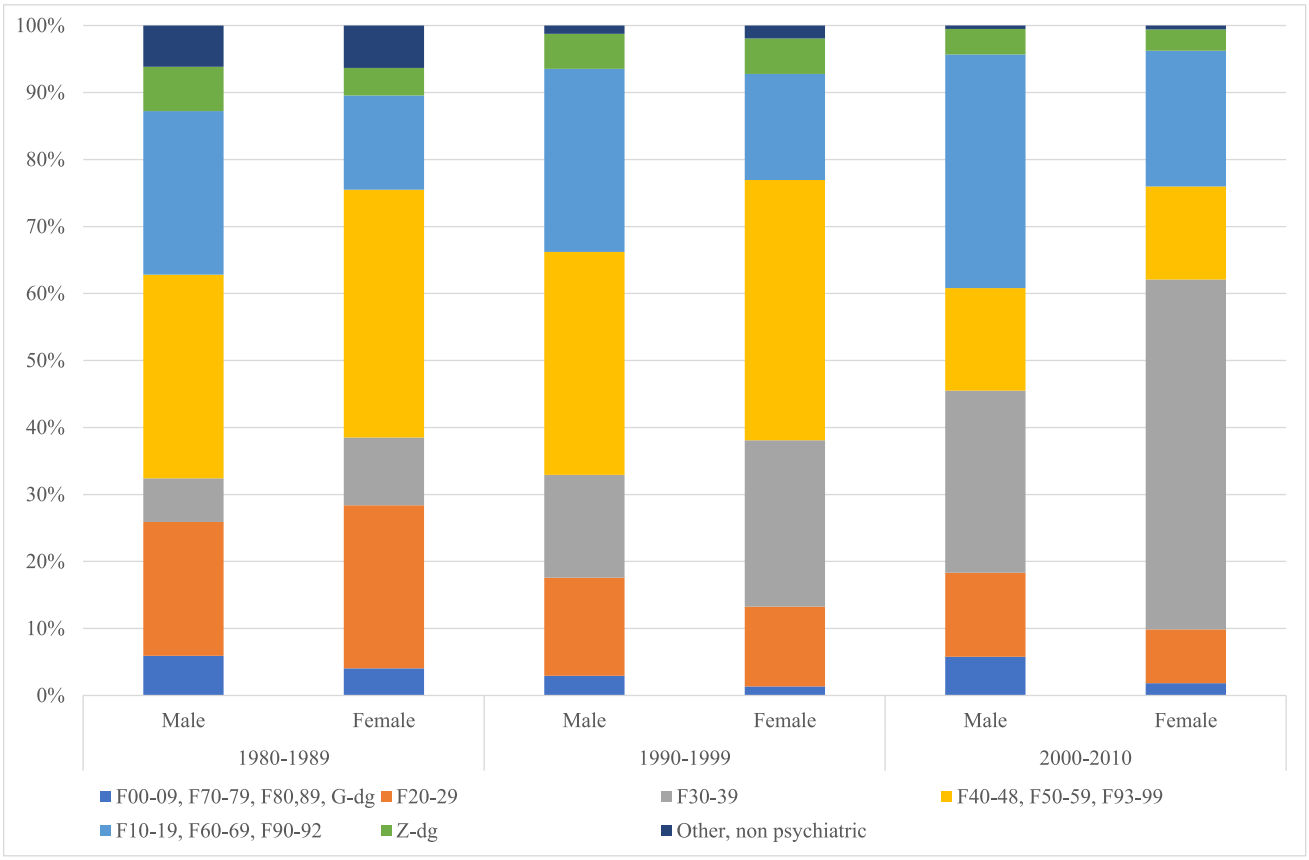

Fig. 2. Distribution of primary ICD-10 diagnoses among subjects admitted to psychiatric inpatient care for the first time at ages 13–17 in 1980–2010.

10.4 per 100,000 (0.01 %) 13–17-year-old adolescents in 1985, 3.7 per 100,000 (0.004 %) in 1995 and 3.9 per 100,000 (0.004 %) in 2005.

3.2. Stability of SCH diagnosed during or before first inpatient care

Of those for whom an SCH diagnosis was set in their first inpatient care, 92.5 % (N = 296/320) had later entries in the studied registers during a mean follow-up time of 24.2 (median 28.6, SD 9.6,) years. Of these 77.2 % had been granted received disability pensions (vs. 26.0 % of those without SCH diagnosis, $p < 0.001$.). Of those with SCH diagnosis at the time of first inpatient care 91.2 % (270) had as SCH diagnosis in the last register entry (inpatient admission or disability pension). The persistence of SCH diagnosis did not differ according to sex or time of index admission. Of early adolescents with SCH at baseline, 75.0 % (15/20) had SCH diagnosis according to the latest register entry, of middle adolescents, 92.4 % (255/276) (p = 0.02). Of those who did not have SCH diagnosis at follow-up (n/N), 15.4 % (4/26) had other F20–29 group psychoses, 19.2 % (5/26) bipolar disorder (F30–31), and the rest had diverse other psychiatric diagnoses.

3.3. Incidence of SCH in follow up among subjects with first psychiatric inpatient admission at ages 13–17

Of those, with no SCH diagnosis in the index inpatient care period, 10.7 % (1800 / 16,792) had later inpatient care or disability pension with SCH diagnosis. Of those with later SCH diagnosis 91.2 % had received disability pension (vs. 18.2 % without later SCH diagnosis, $p <$ 0.001) Of males, 13.7 % (922/6723), and of females, 8.7 % (878/9191) ($p < 0.001$) received an SCH diagnosis during follow-up, as did 5.5 % (297/5372) of those in early adolescence and 13.2 % (1503/11,420) of those in middle adolescence at baseline ($p < 0.001$). A greater proportion of those who had been in inpatient care in 1980–1989 received a subsequent SCH diagnosis than of those first admitted in later decades (1980–1989: 23.0 % (551/2394), 1990–1999: 15.6 % (555/3558), 2000–2010: 6.4 % (694/10,840), $p < 0.001$).

Overall incidence of SCH (diagnosed during or after first psychiatric inpatient care period) in the study population was 21.7 per 100,000 (0.022 %) for those who had been 13–17 years old in 1985, 14.7 per 100,000 (0.015 %) in 1995 and 17.2 per 100,000 (0.017 %) in 2005.

3.4. Predictors of SCH during follow-up

Approximately half of those who at index admission received a diagnosis in group F20–29 (other than F20 or F25) subsequently received an SCH diagnosis. (Table 1). This was uncommon in other diagnostic groups.

In Cox Regression Analysis (Table 2), being male and a middle adolescent at index admission were risk factors for subsequent SCH diagnosis. A baseline primary diagnosis in the F20-F29 group was the most prominent risk factor. A later diagnosis of SCH was less common among those admitted during the latest decade.

4. Discussion

This register-based study focused on subjects who had had their first ever psychiatric inpatient treatment at ages 13–17 between 1980 and 2010. The incidence of schizophrenia disorder (F20 + F25) during adolescence was higher in the study population among those who had been in psychiatric inpatient care in 1980–1989 than in other decades. Overall psychiatric inpatient care during adolescence was a risk factor for subsequent schizophrenia, especially if an F20–29 diagnosis was set. The stability of adolescent onset schizophrenia diagnosis was high.

The higher incidence of schizophrenia diagnosis during adolescence in 1980–89 than in other decades is more likely attributable to a shift of

Table 1
Later schizophrenia diagnosis during follow-up after the index admission among patients admitted to psychiatric inpatient treatment for the first time at ages 13–17 between 1980 and 2010 in Finland. % (n/N).

	F00–09 F70–79 F80–89 G-group	F20–29	F30–39	F10–19 F60–69 F90–92	Z-code	Other, non-psychiatric	F40–48 F50–59 F93–99	p
All $N = 16,792$	6.5 % (33/510)	46.3 % (748/1616)	7.1 % (346/4842)	6.5 % (235/3610)	6.7 % (43/645)	11.5 % (31/269)	6.9 % (364/5300)	< 0.001
Males $N = 6723$	6.9 % (23/331)	50.9 % (418/805)	9.4 % (121/1284)	8.0 % (159/1984)	7.1 % (22/310)	15.3 % (19/124)	8.9 % (168/1885)	< 0.001
Females $N = 10,069$	5.6 % (10/179)	41.7 % (337/811)	6.3 % (225/3558)	4.7 % (76/1626)	6.3 % (21/335)	8.3 % (12/145)	5.7 % (196/3415)	< 0.001

Table 2
Hazard Ratios (95 % confidence intervals) for schizophrenia diagnosis after the index admission among those admitted for psychiatric treatment for the first time at age 13–17 in three decades.

	HR (95 % CI)	p
Sex		
Female	ref	
Male	1.4 (1.3–1.5)	<0.001
Age at index admission		
13–14	ref	
15–17	1.9 (1.7–2.2)	<0.001
Year of index admission		
2000–2010	ref	
1980–1989	2.1 (1.8–2.3)	<0.001
1999–1999	1.6 (1.4–1.8)	<0.001
Primary diagnosis at index admission		
F40–49, F50–59, F93–99	ref	
F00–09, F70–79, F80–89, G	0.8 (0.58–1.2)	0.3
F20–29	7.6 (6.7–8.6)	<0.001
F30–39	1.4 (1.2–1.6)	<0.001
F10–19, F60–69, F90–92	0.9 (0.7–1.1)	0.35
Z-code	0.9 (0.6–1.2)	0.40
Other diagnosis groups	1.0 (0.7–1.4)	0.97

diagnostic trend not to use schizophrenia diagnosis in adolescence than to an actual true decrease in its incidence, as it seems that overall lifetime incidence remained relatively stable. There is debate concerning stigmatization of schizophrenia diagnosis and adolescents' sensitivity about it (González-Torres et al., 2007; Hinshaw, 2005). It is probable that in 1990–1999 and 2000–2010 those who would earlier have been diagnosed directly as having schizophrenia received some to F20-F29 group diagnosis like unspecified F29 psychosis. Changes in psychiatric services may also have influenced diagnosing schizophrenia. The change of focus from inpatient care to a more outpatient-oriented service system due to deinstitutionalization ideology may have affected diagnosing schizophrenia as in outpatient care it is not possible to observe patients' symptoms as thoroughly as in inpatient care, leading to underdiagnosing. However, deinstitutionalization has probably not affected the most severe psychiatric morbidity. In addition, despite a general trend in psychiatry towards deinstitutionalization in adolescent psychiatry, inpatient care appears to have increased in the 1990s and especially in the early 2000s. (Laukkanen et al., 2003).

As in other studies (Hollis, 2000; Remberk et al., 2014; Röpcke and Eggers, 2005; Schwarz et al., 2016; Xu et al., 2020), the stability of schizophrenia diagnosis was high in this study. Interestingly, stability was lower in those who had first inpatient care in early adolescence (age 13-14 yrs) than in middle adolescence (age 15-17 yrs). Usually, schizophrenia diagnosis at a younger age is associated with poorer prognosis (Clemmensen et al., 2012; Hollis, 2000; Röpcke and Eggers, 2005; Schwarz et al., 2016) and therefore it would be more suspect to have later inpatient care or disability pension with that diagnosis. Instability of diagnosis may be due to heterogeneity of symptoms, especially in younger patients. Furthermore, various psychosocial factors also moderate the need for inpatient care, thus making diagnostic assessment harder (Ballageer et al., 2005; Castro-Fornieles et al., 2011; Fraguas et al., 2008). Schizophrenia diagnosis in early adolescence is relatively rare (Clemmensen et al., 2012; McClellan and Stock, 2013) as also observed in this study and the low number of patients causes risk for statistical errors due to type II error.

Almost 11 % of adolescents who at their first inpatient admission received other psychiatric diagnoses were later diagnosed with schizophrenia. This is considerably higher than prevalence rates found at population level. It is possible that some adolescents first diagnosed with other disorders were actually going through the prodromal phase of schizophrenia already at baseline as prodromal symptoms of schizophrenia are diverse and have common characteristics with other psychiatric diagnoses. When considering what diagnoses during adolescence are predictive of subsequent schizophrenia, those who had their first inpatient care due to other F20–29 group disorders had the highest risk over time for subsequent schizophrenia diagnosis. However, half of those with other F20–29 group diagnoses at baseline did not convert to schizophrenia. A considerable share of psychotic disorders in adolescence thus had a more transient nature, a finding also reported in other studies (Ballageer et al., 2005; Castro-Fornieles et al., 2011; Conrad et al., 2016; Correll et al., 2005; Fraguas et al., 2008). Affective disorders (F30–39) also yielded an increased risk for later schizophrenia. This may be due to both actual transition from mood disorders to schizophrenia (Consoli et al., 2014) or overlap between mood disorders and prodromal symptoms (Consoli et al., 2014). In other studies ADHD and conduct problems in childhood/adolescence have been associated with risk for later schizophrenia although the evidence has been inconsistent (Andersen et al., 2013; Dalsgaard et al., 2013; Kim-Cohen et al., 2003; Shyu et al., 2015). However, in this study no statistically significant risk was observed for ADHD, conduct disorder etc. group when compared to other diagnoses in Cox regression analysis.

As observed in this study, the number of adolescents in inpatient care increased remarkably in the last decade of this study. Although percentage proportions of schizophrenia group psychosis diagnoses initially decreased from the 1980s to the 2000s, the absolute number of diagnoses did not. It seems that the number of severe psychiatric disorders during adolescence remained relatively stable over time. Psychotic disorders often exacerbate gradually over time and symptoms become easily recognisable by non-clinicians, therefore leading to and requiring hospitalization (Conrad et al., 2016; Correll et al., 2005) whereas milder symptoms may easily go unrecognized. However, in time, recognizing and understanding the need for effective treatment of milder psychiatric symptoms has evolved and therefore increased the influx of patients with those symptoms to inpatient care, thereby and increasing the overall need for psychiatric inpatient care during adolescence.

The need for psychiatric inpatient care during early or middle adolescence represents a high risk for later schizophrenia. This should be recognized by every healthcare professional treating adolescents who have been in psychiatric inpatient care so that they continually screen for possible risk symptoms for psychotic disorders and offer effective interventions for these. Even though those adolescents who had been in psychiatric inpatient care may receive no additional psychiatric care, they should be monitored by professionals with enough training to recognize further development of psychotic symptoms and be further evaluated by mental health professionals as early as possible. Early recognition of schizophrenia is crucial due to its significant negative effect on an individual's future as observed in this study as a significant risk for disability pension.

5. Limitations

The study population consisted entirely of those who had been in psychiatric inpatient care. It was not representative of those with psychiatric disorders not requiring inpatient care. Therefore, direct conclusions about risk factors for schizophrenia at community level cannot be drawn on the basis of this study because of the selective nature of the study population. It is possible that the incidence of schizophrenia in the study population is even higher than reported because some may have been diagnosed with schizophrenia but did not later require inpatient care or were granted a disability pension. However, when considering the chronic nature of schizophrenia, it is a disorder that commonly leads to hospitalization at some point or causes disability (Clemmensen et al., 2012). Because the study population is from three different decades and therefore follow-up times are considerably different, it is possible that some of those who had been in inpatient care in the later years of 2000–2010 have not yet been diagnosed with schizophrenia but will be later. Exact time to schizophrenia diagnosis is also inaccurate in this study because it was calculated based on time between inpatient periods or disability pension. It is possible that patients have been diagnosed as having schizophrenia earlier in outpatient clinics. Also, in Finland eligibility for a disability pension first requires that an individual has been on sickness benefit for one year. Further, it should be noted that in this register-based study diagnoses were made by clinicians and are not research-based. Also, there were three different versions of diagnostic classifications during this study which may affect the accuracy of the diagnoses. However, the clinical picture of schizophrenia has remained decidedly stable over time (Simeone et al., 2015) and early-onset schizophrenia diagnoses set in inpatient settings have been found reliable and valid for register-based research (Vernal et al., 2018). Also, Finnish register data have been shown to be reliable (Sund, 2012).

An overall strength of this study is the size of the study population and that it is from the whole of Finland and from three different decades. This reduces the effects of diagnostic practices in a single hospital or even by a single clinician and also the overall effect of diagnostic trends.

6. Conclusions

The stability of schizophrenia diagnosed during adolescence is very high, particularly from middle (as opposed to early) adolescence. Adolescents requiring psychiatric inpatient care due to other reasons have a higher later rate of schizophrenia diagnosis than prevalence in community level. Although a variety of psychotic disorders (F20–29 group diagnoses other than F20 or F25) implied a clear risk for later schizophrenia disorder diagnoses, a considerable share of those did not convert to schizophrenia, thus having a more transient nature. Therefore, it is important for clinicians to try to assess which adolescents are at risk having an insidious course of disorders and at the of subsequently developing schizophrenia. Reliance on the initial diagnosis could lead to biased estimates of risk factors, prognosis and misjudgments about optimal treatment as first-admission patients run the risk being misclassified in the early stages of their illnesses. More studies are therefore needed to identify additional risk factors besides diagnosis.

Submission declaration

The manuscript has not been published and is not under consideration for publication elsewhere, All the authors have agreed to the submission of the manuscript in its present form to Schizophrenia Research and agree to its publication in the Journal, if accepted.

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CRediT authorship contribution statement

All authors contributed to the conception and design of the study and to the interpretation of the findings. Data preparation and analysis were performed by Timo Holttinen and Riittakerttu Kaltiala. The first draft of the manuscript was written by Timo Holttinen and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Ethical approval

The study was duly accepted by the ethics committee of Tampere University Hospital and granted the appropriate permissions by the National Institute for Health and Welfare, Finland.

Declaration of competing interest

None.

Data availability

Availability of datasets used and/or analysed in this study is subject to data permits from the respective Finnish register authorities. Readers can contact the corresponding author for more information.

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