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Schizophrenia and induced abortions: A national register-based follow-up study among Finnish women born between 1965–1980 with schizophrenia or schizoaffective disorder

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ABSTRACT

Background: The objectives of this study were to investigate, in women with schizophrenia or schizoaffective disorder, the number and incidence of induced abortions (= pregnancy terminations performed by a physician), their demographic characteristics, use of contraceptives, plus indications of and complications related to pregnancy termination.
Methods: Using the Care Register for Health Care, we identified Finnish women born between the years 1965–1980 who were diagnosed with either schizophrenia or schizoaffective disorder during the follow-up period ending 31.12.2013. For each case, five age- and place-of-birth- matched controls were obtained from the Population Register of Finland. Information about births and induced abortions were obtained from the Medical Birth Register and the Induced Abortion Register.
Results: The number and incidence of induced abortions per 1000 follow-up years did not differ between cases and their controls. However, due to fewer pregnancies, cases exhibited an over 2-fold increased risk of pregnancy termination (RR 2.28; 95% CI 2.20–2.36). Cases were younger, were more often without a partner at the time of induced abortion, and their pregnancies resulted more often from a lack of contraception. Among cases, the indication for pregnancy termination was more often mother-to-be's medical condition. Induced abortions after 12 weeks gestation were more common among cases. However, cases had no more complications related to termination.
Conclusions: The incidence of induced abortions among Finnish women with schizophrenia or schizoaffective disorder is similar to the general population, but their risk per pregnancy over two-fold. They need effective, affordable family planning services and long-term premeditated contraception.

1. Introduction

De-institutionalization and second-generation antipsychotics with less endocrine side-effects have enabled women with schizophrenia spectrum disorders to be more sexually active, leading to a substantial increase in pregnancies among these women (Miller, 1997; Solari et al., 2009; Matevosyan, 2011; Vigod et al., 2012). However, research focusing on the reproductive health of women suffering from schizophrenia has been scarce, and many of the studies are limited by modest sample sizes. Overall, women with schizophrenia are more likely to

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have poorer family planning knowledge than healthy women (Miller and Finnerty, 1998) and they identify personal relationships as one of the treatment areas with the most unmet needs (Burns et al., 2001). More specifically, women with schizophrenia have been reported to have more lifetime sexual partners (Miller and Finnerty, 1996), to more infrequently use contraception (Seeman and Ross, 2011), and, as a consequence of this, to have more unwanted pregnancies (Miller, 1997) and an increased risk for pregnancy termination (Miller and Finnerty, 1998; Dickerson et al., 2004) than women in the general population.

Induced abortion (= termination of pregnancy, which is performed by a legalized physician) is a delicate and highly culture-specific research topic influenced by religion and gender equality, as well as socio-economic conditions and legislation. Findings related to it can therefore be context-specific. Most studies focusing on induced abortions in patients with severe mental illnesses have been conducted in various parts of the U.S. The generalizability of findings between regions, countries and time periods remains uncertain, particularly pertaining to European contexts. Because of this, there is a need for large-scale research representing different contexts to shed light on the relationship between schizophrenia and induced abortions, as well as on the social and medical circumstances associated with pregnancy termination in patients with severe mental illnesses.

The primary aim of this Finnish register-based national population study was to investigate the number and incidence of induced abortions in women with schizophrenia or schizoaffective disorder. The secondary aims were to study the demographic characteristics and use of contraceptives among women with pregnancies ending in induced abortion, as well as indications of and complications related to pregnancy termination.

We hypothesized that compared to age- and place- of-birth-matched controls, (1) pregnancies of women with schizophrenia/schizoaffective disorder would more often lead to induced abortion, (2) women with schizophrenia/schizoaffective disorder undergoing an induced abortion would be younger and more often without a partner, (3) pregnancies of women with schizophrenia/schizoaffective disorder ending in induced abortion would more often be a consequence of not having used any contraception, (4) indications for pregnancy termination in women with schizophrenia/schizoaffective disorder would more often be medical, and that (5) women with schizophrenia/schizoaffective disorder would more often suffer from complications related to induced abortion.

2. Methods

2.1. Participants

The study sample comprised a Finnish national population of women who were born between 1.1.1965–31.12.1980 and diagnosed with schizophrenia or schizoaffective disorder in specialized health care at some point during the follow-up time ending 31.12.2013 (n = 5214).

For each case, five control women were randomly selected from the Finnish Central Population Register, matched for age and place of birth and who had not been diagnosed with schizophrenia, schizoaffective disorder or any other psychotic disorder by the end of the follow-up time. Other mental health disorders, such as depression or mood disorders, were allowed. The total final number of controls was 25,999 because sometimes a control was not found due to strict matching criteria. Also, some of the selected controls had a security prohibition for their personal register data.

2.2. Diagnoses of schizophrenia and schizoaffective disorder

The diagnoses were obtained from the Care Register for Health Care of the National Institute of Health and Welfare. In Finland, psychiatric classification according to the International Classification of Diseases - Eighth Revision (ICD-8) (World Health Organization, 1965) served in clinical practice between 1969 and 1986 (schizophrenia: 295.0-6, 295.8-9; schizoaffective psychosis: 295.7). This classification was later replaced by DSM-III-R (American Psychiatric Association, 1987), used in clinical practice between 1987 and 1995. However, the diagnoses were converted to ICD-9 (World Health Organization, 1977) diagnoses, when, for example, reporting them to the Care Register for Health Care (schizophrenia: 295.0-6, 295.8-9; schizoaffective psychosis: 295.7). Since 1996, ICD-10 (World Health Organization, 1992) has been used in Finland (schizophrenia: F20; schizoaffective psychosis: F25). The onset of schizophrenia was defined as the day when the disorder was diagnosed and coded in specialized health care.

2.3. Follow-up

The cases and their controls were followed from 1.1.1987 until the individual moved abroad, died, or follow-up ended on 31.12.2013. The information on death or emigration was gathered from the Finnish Central Population Register. Altogether, 340 patients (6.5%) and 264 controls (1.0%) died ($p < 0.001$) and 35 patients (0.7%) and 701 controls (2.7%) moved abroad ($p < 0.001$) during the follow-up. The cases were followed, on average, until the age of 41.6 (SD 5.3) years and, respectively, the controls until the age of 41.9 (SD 4.9) years ($p < 0.001$). When the index day of being diagnosed with either schizophrenia or schizoaffective disorder was taken into account, the average follow-up time of cases was 14.0 (SD 6.9) years, and, respectively, of controls 14.3 (SD 6.9) years ($p = 0.001$).

2.4. Legislation for induced abortions in Finland

The current Finnish legislation of induced abortions dates back to 1970. According to the legislation, an induced abortion can be performed under legal indications, which can be categorized into three classes: a) social (the mother-to-be is under 17 or over 40 years old, has already delivered at least four children, lives in crowded housing conditions, etc.), b) medical (severe illness or handicap of the fetus, mother-to-be's medical condition), or c) ethical (the pregnancy is a consequence of a sexual assault, etc.).

Under the legislation, the pregnancy must be terminated as early as possible, normally within the first 12 weeks of gestation. Depending on the indication, one or two physicians are needed in the permission process. The physician with authority to render an opinion and the operating physician shall not be entitled, without a reason, to refuse to consider a request for termination of pregnancy. In cases with a gestation age >12 weeks (<7% of all induced abortions), the permission for induced abortion is granted by the National Abortion Board.

According to the Finnish National Institute for Health and Welfare, the current induced abortion rate is approximately 9/1000 women aged 15–49 (Gissler et al., 2012). The most common indication for pregnancy termination is social (approximately 97% of induced abortions). <3% of all pregnancy terminations are performed because of fetal abnormalities (Induced Abortion: Current Care Guidelines Abstract, 2013).

2.5. Induced abortions

Data were obtained from the Finnish Register of Induced Abortions, maintained by the National Institute of Health and Welfare since 1970 and available electronically since 1983. Heino et al. (2017) recently assessed the quality of the Finnish Register of Induced Abortions and compared it to the Finnish Hospital Discharge Register. The authors concluded that the coverage of the register is excellent (97%), and that the detailed data on different variables reported to the register are accurate. Thus, the register provides a valid basis for research and health-monitoring. In this study, the following variables were collected: (a) the date of the induced abortion, (b) the legal indication(s) for the

procedure, (c) immediate complications related to the operation, (d) the number of previous pregnancies and deliveries, (e) current marital or cohabiting status, and (f) the contraceptive method used at the time of becoming pregnant.

2.6. Births

In order to calculate the proportion of terminated pregnancies among all pregnancies, data on births were obtained from the Medical Birth Register, maintained by the National Institute of Health and Welfare since 1987. This register covers all delivery hospitals in Finland and includes data on live births and stillbirths of fetuses with a birthweight of at least 500 g or a gestational age of at least 22 weeks, as well as data on the mothers.

2.7. Statistical analyses

The induced abortion outcomes were analyzed in two ways. First, we included only each individual's first induced abortion. Second, we included all abortions, irrespective of the number per individual. In order to study the impact of the diagnoses, we investigated the cases separately before and after they were diagnosed with either schizophrenia or schizoaffective disorder.

The Independent Samples *t*-test, the Likelihood Ratio Chi-Square (χ^2)-test, the Test of Relative Proportions, the Wilcoxon signed-rank test, as well as the Cox proportional hazards modeling were used, where appropriate. Findings were considered significant when the two-tailed $p < 0.05$. Risk ratios (RRs), hazard risk ratios (HRs) and odds ratios (ORs) with 95% confidence intervals (95% CIs) were reported as measures of effect size. All statistical analyses were performed with SURVO MM version 3.41 (Survo Systems Oy, Finland; www.survo.fi/english) and SAS version 9.3 (SAS Institute Cary, USA).

2.8. Ethics

The Ethics Committee of Helsinki and Uusimaa Hospital District evaluated and approved the study plan. Permission to use the confidential register data in the study was granted by the National Institute for Health and Welfare and Population Register Centre.

3. Results

3.1. Number and incidence of induced abortions

Altogether, 1587 (30.4%) women with schizophrenia or schizoaffective disorder and 7765 (29.9%) of their controls had undergone at least one induced abortion during the follow-up period (Table 2a). The incidence of induced abortions per 1000 follow-up years did not significantly differ between the groups. However, over the study period, cases had significantly fewer births than their controls (mean 0.65, SD 1.10 vs. mean 1.72, SD 1.38, $p < 0.001$). For example, 50% of the cases, but only 12% of the controls had never given birth ($p < 0.001$). Thus, the proportion of induced abortions among all pregnancies during the follow-up period was significantly higher among women with schizophrenia or schizoaffective disorder (Table 2b). This proportion was 27.7% before and 59.1% after their diagnosis was assigned.

Among women with schizophrenia or schizoaffective disorder, the number of induced abortions ranged from one to seven: 725 (68.0%) persons had one, 232 (21.7%) had two, 72 (6.7%) had three, and 38 (3.6%) had four or more induced abortions in their medical histories. Among controls, the number of induced abortions ranged from one to ten: 3980 persons (72.8%) had one, 1028 (18.8%) had two, 299 (5.5%) had three, and 163 (3.0%) had four or more induced abortions ($p < 0.001$). The number of induced abortions did not significantly differ between cases and their controls (cases: median 1 vs. controls: median 1; $p = 0.278$).

3.2. Demographic characteristics

Women with schizophrenia or schizoaffective disorder were significantly younger at the time of their induced abortions than their controls (first induced abortion: $p < 0.001$; all induced abortions: $p < 0.001$) (Table 1). Cases were significantly more likely to be single and less likely to be married/co-habiting at the time of their induced abortions than their controls (first induced abortion: $p < 0.001$; all induced abortions: $p < 0.001$).

3.3. Indications for induced abortion

Social indication was the most common type of legal indication in both groups with no significant group difference (Table 3). Medical indication due to the mother-to-be was found to be significantly more prevalent among cases than controls (first induced abortion: $p < 0.001$; all induced abortions: $p < 0.001$). In contrast, induced abortion due to the medical condition of the fetus was significantly more common among controls than cases (first induced abortion: $p = 0.001$; all induced abortions: $p < 0.001$). Ethical indication was rare in both groups, with no significant group difference.

3.4. Induced abortions in gestational weeks 12–24

Induced abortions in gestational weeks 12+ were significantly more prevalent among cases (first induced abortion: $p = 0.019$; all induced abortions: $p < 0.001$) (Table 3). With regard to first induced abortions, those occurring in gestational weeks 20+ were significantly more prevalent in controls ($p = 0.015$), but when all induced abortions were taken into account, no statistically significant difference was observed.

3.5. Use of contraception

Almost half of the cases had used no contraceptive method before becoming pregnant and this proportion in cases was significantly higher than among their controls (first induced abortion: $p < 0.001$; all induced abortions: $p < 0.001$) (Table 4). Of various contraceptive methods, condoms were the most commonly used, followed by intrauterine devices in both groups. The use of condoms was significantly less common among cases than controls (first induced abortion: $p < 0.001$; all induced abortions: $p < 0.001$).

3.6. Immediate complications due to the induced abortion

Immediate complications were rare in both groups (Table 5). With regard to all induced abortions, controls significantly more often had

Table 1
Marital status and age of women with schizophrenia or schizoaffective disorder and their controls with induced abortions.

First induced abortion	Cases (n = 1069)	Controls (n = 5503)	p
Single, n (%)	907 (84.8)	4125 (75.0)	<0.001
Married/co-habiting, n (%)	114 (10.7)	1067 (19.4)	<0.001
Divorced/separated/widowed, n (%)	46 (4.3)	294 (5.3)	0.085
Missing information, n (%)	2 (0.2)	17 (0.3)	0.454
Age, mean (SD)	23.5 (5.5)	24.9 (6.7)	<0.001
All induced abortions	**Cases (n = 1587)**	**Controls (n = 7765)**	**p**
Single, n (%)	1282 (80.8)	5578 (71.8)	<0.001
Married/co-habiting, n (%)	187 (11.8)	1583 (20.4)	<0.001
Divorced/separated/widowed, n (%)	114 (7.2)	575 (7.4)	0.758
Missing information, n (%)	4 (0.3)	29 (0.4)	0.457
Age, mean (SD)	24.8 (5.8)	26.2 (6.9)	<0.001

The Likelihood Ratio Chi-Square (X^2) - test and the Independent Samples *t*-test (age) were used to compare the groups. SD = standard deviation.

Table 2a
Prevalence of induced abortions and births in women with schizophrenia or schizoaffective disorder (n = 5214) and their age- and place-of-birth-matched controls (n = 25,999) before and after diagnosis.

	n	%	Per 1000 follow-up years	Abortions per woman	Crude Risk Ratio (95% CI)	Hazard Ratio (95% CI)
Women with abortions before diagnosis						
Cases	290	5.6	10.4	1.49	0.68 (0.60–0.76)	0.66 (0.58–0.75)
Controls	2136	8.2	15.6	1.43		
Persons with abortions after diagnosis						
Cases	916	17.6	22.9	1.43	0.99 (0.93–1.06)	0.99 (0.92–1.07)
Controls	4606	17.7	24.9	1.39		

	n	%	Per 1000 follow-up years	Births per woman	Crude Risk Ratio (95% CI)	Hazard Ratio (95% CI)
Women with births before diagnosis						
Cases	597	11.4	18.0	1.99	0.27 (0.25–0.29)	0.26 (0.18–0.35)
Controls	10,955	42.1	81.3	2.44		
Persons with births after diagnosis						
Cases	573	11.0	8.2	2.01	0.27 (0.26–0.30)	0.29 (0.20–0.37)
Controls	10,446	40.2	29.5	2.46		

at least one operative complication than cases (p = 0.038). The differences in different specific complication categories, however, did not reach statistical significance.

4. Discussion

In this Finnish register-based, national population study, we investigated the relationship between schizophrenia and induced abortions and shed light on the social and medical circumstances associated with pregnancy termination among these women.

In line with both our first hypothesis and previous American studies by Miller and Finnerty (1998) and Dickerson et al. (2004), pregnancies in Finland among women with schizophrenia or schizoaffective disorder often led to induced abortions. More precisely, the number and incidence of induced abortions among women with schizophrenia or schizoaffective disorder did not differ from those of their controls in the general population, but the number of births was substantially lower among the cases than among their controls, as reported in previous cohort studies (Howard et al., 2002; Haukka et al., 2003; Svensson et al., 2007; Laursen and Munk-Olsen, 2010). Thus, when all pregnancies were taken into account, women with schizophrenia or schizoaffective disorder showed a >2-fold increased risk per pregnancy for an induced abortion. This increased risk could be observed both prior to and after the diagnosis of schizophrenia or schizoaffective disorder was assigned in specialized health care.

Table 2b
The proportion of induced abortions among all pregnancies (induced abortions and births) before and after diagnosis.

	Abortions n	Births n	Total n	%	Risk ratio (95% CI)
Proportion of induced abortions among all pregnancies before diagnosis					
Cases	455	1642	2097	27.7	2.58 (2.18–2.37)
Controls	3230	26,738	29,968	11.7	
Proportion of induced abortions among all pregnancies after diagnosis					
Cases	1666	2817	4483	59.1	2.28 (2.20–2.36)
Controls	6588	25,660	32,248	25.9	

Table 3
Indications for induced abortions and gestational age at the time of induced abortion in women with schizophrenia or schizoaffective disorder and their controls.

First induced abortion	Cases (n = 1069)	Controls (n = 5503)	p
Social, n (%)	1005 (94.0)	5195 (94.4)	0.614
Medical due to mother, n (%)	22 (2.1)	20 (0.4)	<0.001
Medical due to fetus, n (%)	14 (1.3)	173 (3.1)	0.001
Ethical, n (%)	– (0.0)	3 (0.1)	0.445
No information, n (%)	35 (3.3)	118 (2.1)	0.025
Gestational age in the time of induced abortion			
12+ weeks, n (%)	164 (15.4)	703 (12.8)	0.019
20+ weeks, n (%)	5 (0.5)	71 (1.3)	0.015

All induced abortions	Cases (n = 1587)	Controls (n = 7765)	p
Social, n (%)	1474 (92.9)	7350 (94.7)	0.005
Medical due to mother, n (%)	32 (2.0)	27 (0.3)	<0.001
Medical due to fetus, n (%)	21 (1.3)	215 (2.8)	<0.001
Ethical, n (%)	1 (0.1)	4 (0.1)	0.857
No information, n (%)	68 (4.3)	179 (2.3)	<0.001
Gestational age in the time of induced abortion			
12+ weeks, n (%)	247 (15.6)	950 (12.2)	<0.001
20+ weeks, n (%)	9 (0.6)	83 (1.1)	0.065

Multiple indications were possible. The test of relative proportions (indications) and the Likelihood Ratio Chi-Square (X^2) test were used to compare the groups.

As we hypothesized, women with schizophrenia or schizoaffective disorder undergoing an induced abortion were substantially younger than their counterparts in the general population. In line with the review by Matevosyan (2009), they were also more often than their counterparts without a partner with whom to share the responsibility of parenthood and from whom to receive support. According to previous research (Miller, 1997; Seeman and Ross, 2011), almost half of the pregnancies among women with schizophrenia or schizoaffective disorder ending in an induced abortion were due to a lack of contraception use. Our finding was similar, both when only the first pregnancy termination or all induced abortions were taken into account. Sexually risky behavior, including a lack of use of contraception, may be due to a lack of information, a lack of planning ability and motivation, as well as due to an inaccurate assessment of risks (Seeman, 2013). Due to these factors, proactive family planning, as well as contraceptive counseling, has been regarded as an essential part of the comprehensive care of women with schizophrenia spectrum disorders (Solari et al., 2009; Seeman, 2013). Attempts to teach safe sex to patients with schizophrenia have proven successful in the short term (Berman and Rozensky, 1984; Kalichman et al., 1995), but, unfortunately, without reinforcement, the acquired knowledge and skills seem to decay over time (Kalichman et al., 1995).

Table 4
The most frequently used contraceptive methods before the pregnancy which ended in an induced abortion in women with schizophrenia or schizoaffective disorder and their controls.

First induced abortion	Cases (n = 1069)	Controls (n = 5503)	p
No contraception used, n (%)	496 (46.4)	2010 (36.5)	<0.001
Condom, n (%)	441 (41.3)	2677 (48.6)	<0.001
Intra-uterine device, n (%)	16 (1.5)	84 (1.5)	0.795
Day after pill, n (%)	11 (1.0)	37 (0.7)	0.271
Oral contraception, n (%)	– (0.0)	16 (0.3)	0.070

All induced abortions	Cases (n = 1587)	Controls (n = 7765)	p
No contraception used, n (%)	734 (46.3)	2728 (35.1)	<0.001
Condom, n (%)	624 (39.3)	3712 (47.8)	<0.001
Intra-uterine device, n (%)	28 (1.8)	115 (1.5)	0.402
Day after pill, n (%)	13 (0.8)	88 (1.1)	0.270
Oral contraception, n (%)	3 (0.2)	35 (0.5)	0.135

The Likelihood Ratio Chi-Square (X^2) was used to compare the groups.

Table 5
Complications of induced abortions in women with schizophrenia or schizoaffective disorder and their controls.

First induced abortion	Cases (n = 1069)	Controls (n = 5503)	p
No complications, n (%)	1022 (95.6)	5185 (94.2)	0.068
At least one complication, n (%)	17 (1.6)	133 (2.4)	0.064
Incomplete abortion[a], n (%)	13 (1.2)	84 (1.5)	0.347
Cervical rupture, n (%)	– (0.0)	7 (0.1)	0.231
Postoperative infection, n (%)	– (0.0)	2 (0.04)	0.522
Other complications, n (%)	4 (0.4)	40 (0.7)	0.163
No information, n (%)	27 (2.5)	136 (2.5)	0.889
All induced abortions	Cases (n = 1587)	Controls (n = 7765)	p
No complications, n (%)	1515 (95.5)	7278 (93.7)	0.004
At least one complication, n (%)	26 (1.6)	205 (2.6)	0.038
Incomplete abortion[a], n (%)	19 (1.2)	136 (1.8)	0.115
Cervical rupture, n (%)	– (0.0)	13 (0.2)	0.103
Postoperative infection, n (%)	– (0.0)	4 (0.05)	0.363
Other complications, n (%)	7 (0.4)	54 (0.7)	0.251
No information, n (%)	39 (2.5)	193 (2.5)	0.948

Multiple complications were possible. The test of relative proportions was used to compare the groups.

[a] Incomplete abortion = amniotic sac, abiotic fetus or placenta left in the uterus, bleeding.

We found that the indication for pregnancy termination in Finland was social in nature in over 90% of both women with schizophrenia or schizoaffective disorder and controls. Although the abortion legislation in Finland is liberal, the decision of the induced abortion is nevertheless carefully made; actual rates of abortion are stable and low in international comparison (Heikinheimo et al., 2008), and illegal abortions very rare. Keski-Petäjä's (2012) study on women seeking a legal pregnancy termination in Finland shows the effect of the change in abortion policy from strict to more liberal, from the 1950′s to present day. Over 80% in 1955 and 68% in 1968 of the abortion requests in Finland were denied. However, the changes in the general social and political climates and the development of the modern Nordic health-care system also resulted in a transformation of the legislation concerning induced abortion in 1970. In the present study with regard to medical indications, our hypothesis turned out to be only partly right: medical indication due to the mother-to-be was relatively rare, but was substantially more common in women with schizophrenia or schizoaffective disorder than in controls, presumably due to medication in use and/or the effects of the illness itself (Bassett et al., 1996). In contrast to this, medical indication due to the fetus turned out to be substantially more prevalent in controls than in women with schizophrenia or schizoaffective disorder. The finding was somewhat unexpected as maternal schizophrenia is related to fetal abnormalities (Jablensky et al., 2005). Whether this is related to pharmacotherapy reducing schizophrenic-related abnormalities or the younger age at pregnancy of the women with schizophrenia or schizoaffective disorder (risk for chromosomal abnormalities is higher among older women), or due to fetal abnormalities not been detected because the mother-to-be had not attended prenatal screening, can only be speculated. It might also be that women with schizophrenia/or schizoaffective disorder are more reluctant to terminate the pregnancy because of illness or handicap of the fetus. The finding obviously needs further research, including a study of the health of the newborns from both groups. Induced abortions due to ethical reasons turned out to be extremely rare. The finding was somewhat unexpected since previous studies have reported that women with schizophrenia experience high rates of both sexual abuse and assault (Miller, 1997; Babbitt et al., 2014).

With regard to late pregnancy terminations, those performed later than 12 gestational weeks were significantly more prevalent among women with schizophrenia or schizoaffective disorder than among their controls. Reasons for this might be late recognition of pregnancy (Solari et al., 2009) due to a misinterpretation of somatic changes (Miller, 1997) or even denial of pregnancy (Miller, 1990; Jenkins et al., 2011; Babbitt et al., 2014) or challenges in decision making (Babbitt et al., 2014). However, with regard to first induced abortions, those performed after 20 gestational weeks were substantially more prevalent among the controls. Explanations for this might be that women with schizophrenia or schizoaffective disorder do not attend obligatory prenatal screenings as frequently as controls, but verifying this obviously requires further research. Furthermore, the decision to go through an induced abortion this far into a pregnancy requires a strong mental capacity, which might be extremely difficult for persons with serious mental illness.

The number of women with acute complications related to pregnancy termination was relatively low in both groups, which most likely mirrors the relatively uniform and high quality of Finnish national healthcare services, as well as the fact that the majority of induced abortions are medical terminations, which are known to affect less complications than surgical ones (Induced abortion: Current Care Guidelines Abstract, 2013). Even though schizophrenia is associated with high rates of comorbid physical illnesses (Dieset et al., 2016), as well as smoking (De Leon and Diaz, 2005) and obesity (Dipasquale et al., 2013), the number of persons with one or more somatic complications turned out to be lower among the cases than their controls. Negative symptoms of schizophrenia are known to provide body sensation difficulties, which might reduce a patient's ability to recognize abnormalities like symptoms of infection or excessive bleeding, which might partly explain the finding.

4.1. Strengths and limitations

The strengths of this study include our ability to investigate the Finnish national female population of patients with schizophrenia or schizoaffective disorder, the long follow-up time, and the high quality of information from the Care Register for Health Care (Aro et al., 1990), the Register of Induced Abortions (Gissler et al., 1996; Heino et al., 2017), and the Medical Birth Register (Gissler et al., 1995) as well as the reliable diagnoses of psychotic disorders (Isohanni et al., 1997; Pihlajamaa et al., 2008). All citizens in Finland have a unique personal identification number which allows linkage between different national registers. We used an age- and place-of-birth-matched control group for comparison, but confounding factors such as socioeconomic status were not taken into account. This might have slightly affected the outcomes related to the reasons for induced abortions and the usage of contraceptive methods. In Finland, most patients with schizophrenia are on disability pension (Perälä et al., 2008). However, the municipal healthcare system in Finland is funded by tax revenues and is available to all citizens. In the present study, we assumed that the onset of schizophrenia was the day when the disorder was diagnosed in specialized healthcare, but, unfortunately, we had no information before this, for example on the onset and severity of psychiatric symptoms. Illegal induced abortions were not possible to take into account, but the national legislation has been liberal since 1970 and illegal abortions are likely to be very rare. With regard to complications, those with delayed occurrence are not, unfortunately, recorded in the Register of Induced Abortions. One must also take into account that in register-based studies like the present one, there is a possibility of misclassification. It might be that some women with schizophrenia/schizoaffective disorder have not been able or willing to give adequate information about the circumstances related to their pregnancies. For example, they may not have disclosed that the index pregnancy was due to sexual assault. Moreover, some data were missing, ranging from 0.2% (marital status) to 4.3% (indication of the induced abortion). Measurements related to the proportion of induced abortions among all pregnancies was limited to years 1987–2013, since the national registers were initiated at different times.

5. Conclusions

In Finland, the number and incidence of induced abortions did not substantially differ between women with schizophrenia or schizoaffective

disorder and their controls in the general population. However, with regard to the proportion of induced abortions among all pregnancies, women with schizophrenia or schizoaffective disorder exhibited a >2-fold increased risk of pregnancy termination. Proactive family planning might reduce the rate of unwanted pregnancies, and our findings emphasize the importance of integrating family planning counseling, as well as reproductive health education, into the psychosocial rehabilitation programs.

Contributors

All authors participated in designing the study plan. Laura Simoila collected the data. Laura Simoila and Mika Gissler analyzed the data. Laura Simoila drafted the paper as the first author, and Erkki Isometsä and Nina Lindberg supervised, and Mika Gissler, Jaana Suvisaari, Erja Halmesmäki and Eila Sailas participated in the writing process. All authors read and approved the final manuscript.

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Conflict of interest

None.

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