Relationship between induced abortion and the incidence of depression, anxiety disorder, adjustment disorder, and somatoform disorder in Germany

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ABSTRACT

Aim: The goal of this retrospective cohort study was to analyze the relationship between induced abortion and the incidence of depression, anxiety disorder, adjustment disorder, and somatoform disorder in Germany.
Methods: Women who had undergone induced abortions for the first time in 281 gynecological practices in Germany between January 2007 and December 2016 were included (index date). Women with live births were matched (1:1) to those with induced abortion by age, index year, and physician. The main outcome of the study was the incidence of depression, anxiety disorder, adjustment disorder, and somatoform disorder as a function of induced abortion. Survival analyses and Cox regression models were used to investigate the association between induced abortion and psychiatric disorders.
Results: This study included 17581 women who had had an induced abortion and 17581 women who had had a live birth. Within 10 years of the index date, 6.7% of the participants with induced abortions and 5.4% of those with live births were diagnosed with depression (log-rank p-value = 0.003). The respective figures were 3.4% and 2.7% for anxiety disorder (log-rank p-value = 0.255), 6.2% and 5.6% for adjustment disorder (log-rank p-value = 0.116), and 19.3% and 13.3% for somatoform disorder (log-rank p-value < 0.001). Induced abortion was significantly associated with depression (hazard ratio [HR] = 1.34), adjustment disorder (HR = 1.45) and somatoform disorder (HR = 1.56), but not with anxiety disorder (HR = 1.17).
Conclusions: There was a positive association between induced abortion and several psychiatric disorders in Germany. Further analyses are recommended to assess how induced abortion can have such a negative impact on mental health.

1. Introduction

Induced abortion is a common procedure and approximately 56 million abortions have been performed each year between 2010 and 2014 worldwide (Sedgh et al., 2016). During that same period of time, around one in four pregnancies ended in induced abortion. Although induced abortion is considered a safe procedure nowadays, it is a risk factor for several physical conditions such as placenta previa (Johnson et al., 2003), hypertension (Yang et al., 2018), and metabolic syndrome (Xu et al., 2013). Therefore, further research is needed to gain a better understanding of the long-term impact of induced abortion on the physical and mental health of women.

Over the past years, several studies have focused on the induced abortion-psychiatric disorder relationship, but their findings were sometimes contradictory (Pedersen, 2008; Coleman et al., 2009a; Mota et al., 2010; Munk-Olsen et al., 2011; Steinberg et al., 2014; Biggs et al., 2016, 2017; Sullins, 2016; Gomez, 2018; Luo et al., 2018). For example, one recent cross-sectional study including over 5100 women from China reported that induced abortion was associated with a 1.89-fold increase in the risk of past-year suicidal ideation (Luo et al., 2018), suggesting that induced abortion may have major negative effects on women's mental health in this country. By contrast, another analysis using longitudinal data from the United States revealed that there was no significant association between abortion after an unwanted first pregnancy and subsequent depressive symptoms (Gomez, 2018). Although the discrepancy in the literature may be partially explained by the methodological differences between the studies, it is likely that there are major differences in the management of women after abortion between countries, and it is thus possible that the association between induced abortion and psychiatric disorders is population- or context-

specific. Taking this into consideration, it seems to be essential that more data from diverse settings be obtained in order to further our understanding of these complex associations.

Therefore, the goal of this retrospective cohort study including women followed in gynecological practices in Germany was to analyze the relationship between induced abortion and the incidence of depression, anxiety disorder, adjustment disorder, and somatoform disorder.

2. Methods

2.1. Database

This study was based on data from the Disease Analyzer database (IQVIA), which compiles drug prescriptions, diagnoses, and basic medical and demographic data obtained directly and in anonymous format from computer systems used in the practices of general practitioners and specialists (Rathmann et al., 2018). Diagnoses (International Classification of Diseases, 10th revision [ICD 10]), prescriptions (Anatomical Therapeutic Chemical [ATC] classification system), and the quality of reported data are being monitored by IQVIA based on a number of criteria (e.g., completeness of documentation, linkage between diagnoses and prescriptions).

In Germany, the sampling methods used for the selection of medical practices were appropriate for obtaining a representative database of general and specialized practices (Rathmann et al., 2018). The prescription statistics for several drugs were very similar to the data available from pharmaceutical prescription reports. The age groups for the given diagnoses in the Disease Analyzer database also matched those in corresponding disease registries. Finally, several other studies published in recent years and focusing on psychiatric disorders in gynecological practices have used this database (Jacob et al., 2016, 2017; Kostev et al., 2017).

2.2. Study population

This study included women who had undergone induced abortions (ICD 10: O04) for the first time in one of 281 gynecological practices in Germany between January 2007 and December 2016 (index date). There were several inclusion criteria: no documentation of pregnancy with abortive outcome (O00-O08) or delivery including antenatal screening and postpartum care (O80-O84, Z36-Z39) in their medical history prior to the index date or within 10 years after the index date; age between 12 and 45 years at index date; and no diagnosis of depression, anxiety disorder, adjustment disorder, or somatoform disorder prior to the index date. After applying similar inclusion criteria, women who had had live births were matched (1:1) to those who had had induced abortions by age, index year, and physician. The index date for the live birth group was a randomly selected visit between January 2007 and December 2016 (Fig. 1).

2.3. Study outcome and variables

The main outcome of the study was the incidence of depression, anxiety disorder, adjustment disorder, and somatoform disorder as a function of induced abortion. These four psychiatric disorders were included in the analysis because they are frequently triggered by stressful life events. The only covariable was age.

2.4. Statistical analyses

The cumulative incidence of each psychiatric disorder (i.e. depression, anxiety disorder, adjustment disorder, somatoform disorder) was shown for up to 10 years after the index date using Kaplan-Meier curves. Log-rank tests were used to compare women with induced abortions versus women with live births. Cox regression models were

created to determine the effect of induced abortion on the incidence of depression, anxiety disorder, adjustment disorder, and somatoform disorder in the overall population and in the different age groups. A p-value of < 0.05 was considered statistically significant. All analyses were carried out using SAS 9.4 (SAS Institute, Cary, USA).

3. Results

This study included 17581 women who had had induced abortions and 17581 women who had had live births. The mean age was 32.7 (SD 5.4) years, and 24.0% of the population was aged between 26 and 30 years (Fig. 2). The results of the Kaplan-Meier analyses are displayed in Fig. 3. Within 10 years of the induced abortion or live birth, 6.7% of the women who had had induced abortions and 5.4% of those who had had live births were diagnosed with depression (log-rank p-value = 0.003). The respective figures were 3.4% and 2.7% for anxiety disorder (log-rank p-value = 0.255), 6.2% and 5.6% for adjustment disorder (log-rank p-value = 0.116), and 19.3% and 13.3% for somatoform disorder (log-rank p-value < 0.001). The results of the Cox regression models are shown in Table 1. Induced abortion was positively associated with depression (hazard ratio [HR] = 1.34; 95% confidence interval [CI]: 1.11–1.64), adjustment disorder (HR = 1.45; 95% CI: 1.19–1.76) and somatoform disorder (HR = 1.56; 95% CI: 1.38–1.76), but not with anxiety disorder (HR = 1.17; 95% CI: 0.89–1.54). Sensitivity analyses further revealed that these associations were significant in older age groups (e.g., 31–35, 36–40, 41–45 years).

4. Discussion

4.1. Main findings

This retrospective cohort study, including more than 35000 women followed in gynecological practices in Germany, found that the incidence of depression and somatoform disorder was higher in those with induced abortions than in those with live births. Cox regression models further showed that induced abortion was associated with depression, adjustment disorder, and somatoform disorder.

4.2. Interpretation of the findings

Several authors have investigated the association between induced abortion and depression in the last decades. In 2008, Pedersen observed, in a sample of 768 women aged between 15 and 27 years from Norway, that individuals who had reported having an abortion in their twenties were at a particular risk for depression (odds ratio [OR] = 2.9), although there was no significant relationship between teenage abortion and this psychiatric disorder (Pedersen, 2008). One year later, Coleman et al. reported, using data from a national co-morbidity survey conducted in the United States, that abortion was a significant predictor for major depression and that abortion accounted for between 4.3% and 4.6% of the incidence of this particular condition (Coleman et al., 2009a). In 2010, Mota and colleagues confirmed these findings in 3310 women aged 18 years and older, as there was a positive association between abortion and major depression (OR = 1.51) (Mota et al., 2010). In line with these three previous studies, we found that induced abortion was associated with a 1.34-fold increase in the incidence of depression.

Regarding adjustment disorder, to the best of our knowledge, there is no study investigating the potential relationship between induced abortion and this psychiatric condition. However, a previous analysis using the same database has estimated that spontaneous abortion is a risk factor for the development of adjustment disorder in the year following this procedure (Jacob et al., 2017). Furthermore, there is an extensive body of literature highlighting the fact that a substantial proportion of women who have undergone induced abortions have difficulties coping with this major event. In 1998, researchers from
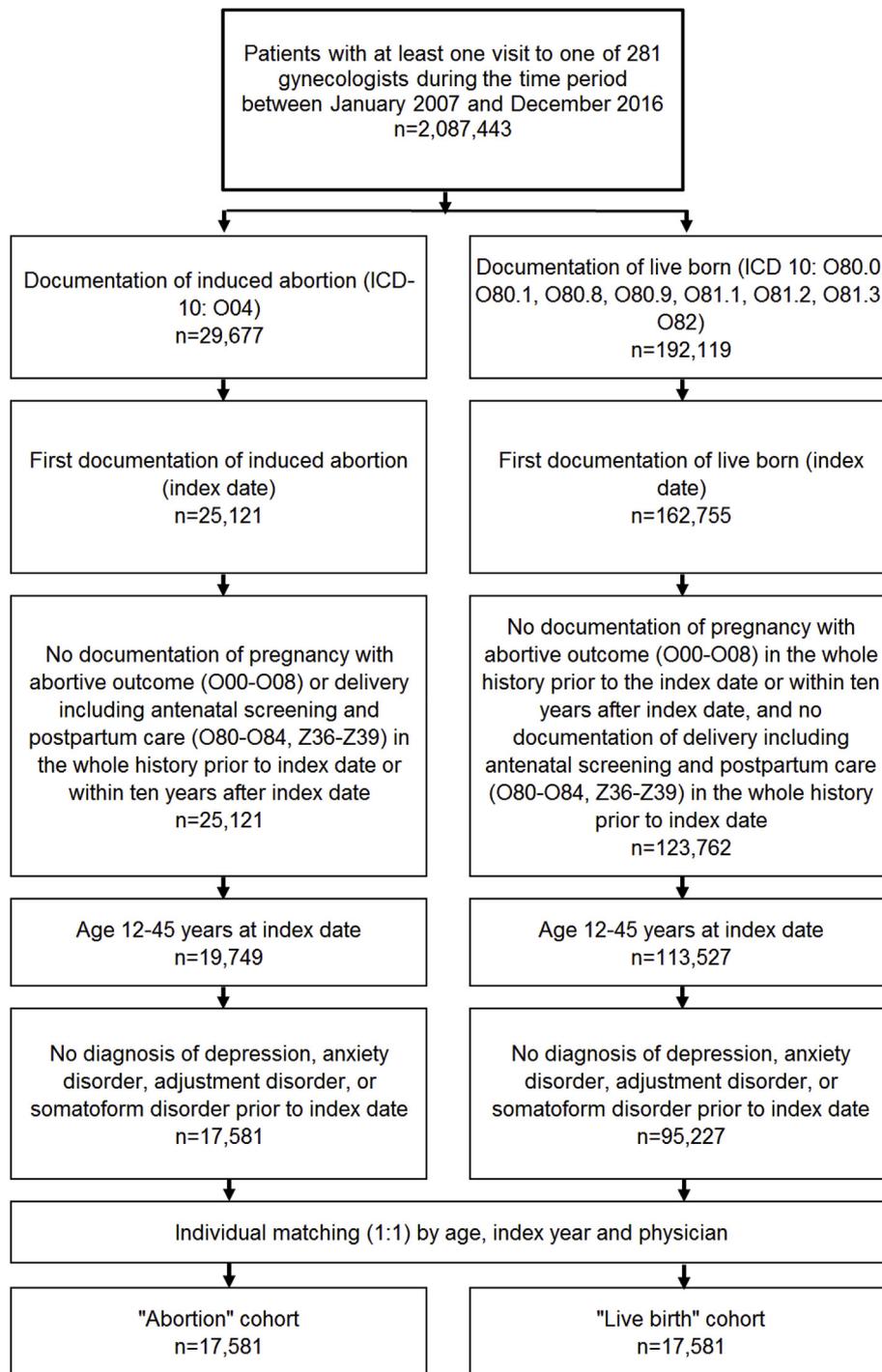
Fig. 1. Selection of study patients.

Sweden observed, in a sample of 854 individuals, that 55% of them had experienced remorse or emotional distress and that 16% displayed persistent emotional distress at the time of the interview (Söderberg et al., 1998). In 2007, Goodwin and Ogden confirmed that some women still experienced negative emotions several years after the induced abortion, suggesting that this procedure may have a long-term impact on the well-being of patients (Goodwin and Ogden, 2007). Finally, in 2010, Vukelić et al. showed, in 40 women from Serbia, that more than 52% of them were diagnosed with acute stress disorder within seven days of an induced abortion, and that those affected by this condition often reported guilt, irritability, shame, self-judgment, fear of God, and self-hatred (Vukelić et al., 2010). In the case of somatoform disorder,

we discovered that this psychiatric disease is positively associated with induced abortion. Since this finding is very new, it should be corroborated by other studies conducted in other settings and countries before drawing any conclusions.

There are several hypotheses that could explain the relationship between induced abortion and mental health. Firstly, an unplanned pregnancy may have a direct impact on the odds of susceptible women developing psychiatric disorders (Mota et al., 2010). Unplanned pregnancy and induced abortion are sometimes experienced as major stressful life events potentially leading to the appearance of psychiatric symptoms (e.g., sadness, loss of vital energy, anxiety). This may be related to the fact that some women may feel pressured to have the
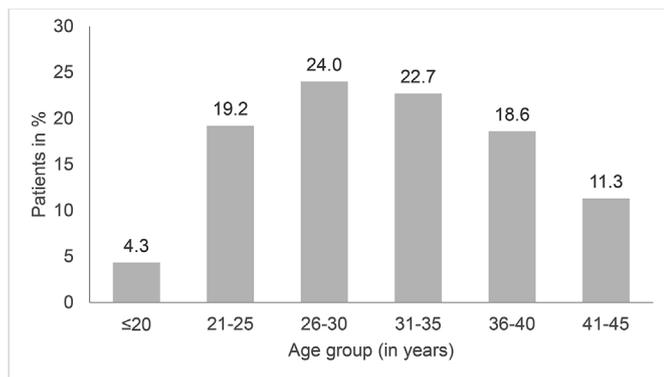
Fig. 2. Age structure of study patients after (1:1) matching by age, index year, and physician.

abortion or may undergo an induced abortion even if it goes against their maternal instincts or moral beliefs (Reardon, 2018). Secondly, it is possible that the induced abortion-mental health association is mediated by several factors. For example, abortion is a well-known risk factor for poor intimate relationship quality (Coleman et al., 2009b), while poor intimate relationship quality may be positively associated with several psychiatric conditions (Whisman et al., 2014). Another potential key mediator is sexual dysfunction, as induced abortion favors the risk of sexual dysfunction (Fok et al., 2006), and sexuality is strongly correlated with mental health (Blais et al., 2018).

4.3. Clinical implications and further research

Based on these results, information on the potential impact of induced abortion on mental health should be given to women before the abortion procedure is scheduled, particularly to those who are already at a high risk of being diagnosed with depression, anxiety, or other mental health conditions. Future research should focus on the potential mediating factors involved in the relationship between induced abortion and psychiatric disorders.

4.4. Strengths and limitations

The two major strengths of this study are the number of women available for analysis and the use of real-world data from gynecological practices where diagnoses are continuously documented, allowing for unbiased exposure assessment (no recall bias). Nonetheless, the results of the present study should be interpreted in the light of several limitations. Firstly, diagnoses relied on ICD 10 codes only, and there was no information on the severity of the psychiatric disorders examined. Secondly, psychiatric disorders may have been insufficiently documented by gynecologists, leading to an underestimation of depression, anxiety disorder, adjustment disorder, and somatoform disorder. Thirdly, we had no data on factors known to have a significant impact on mental health (e.g., loneliness, social support, alcohol use), and this may have biased our findings. Finally, this was a retrospective study, and it was thus not possible to determine causality or temporality in the association between induced abortion and psychiatric disorders.

5. Conclusions

A positive association was found between induced abortion and several psychiatric disorders in Germany. Further research is recommended to assess whether and to what extent induced abortion has a negative impact on mental health.
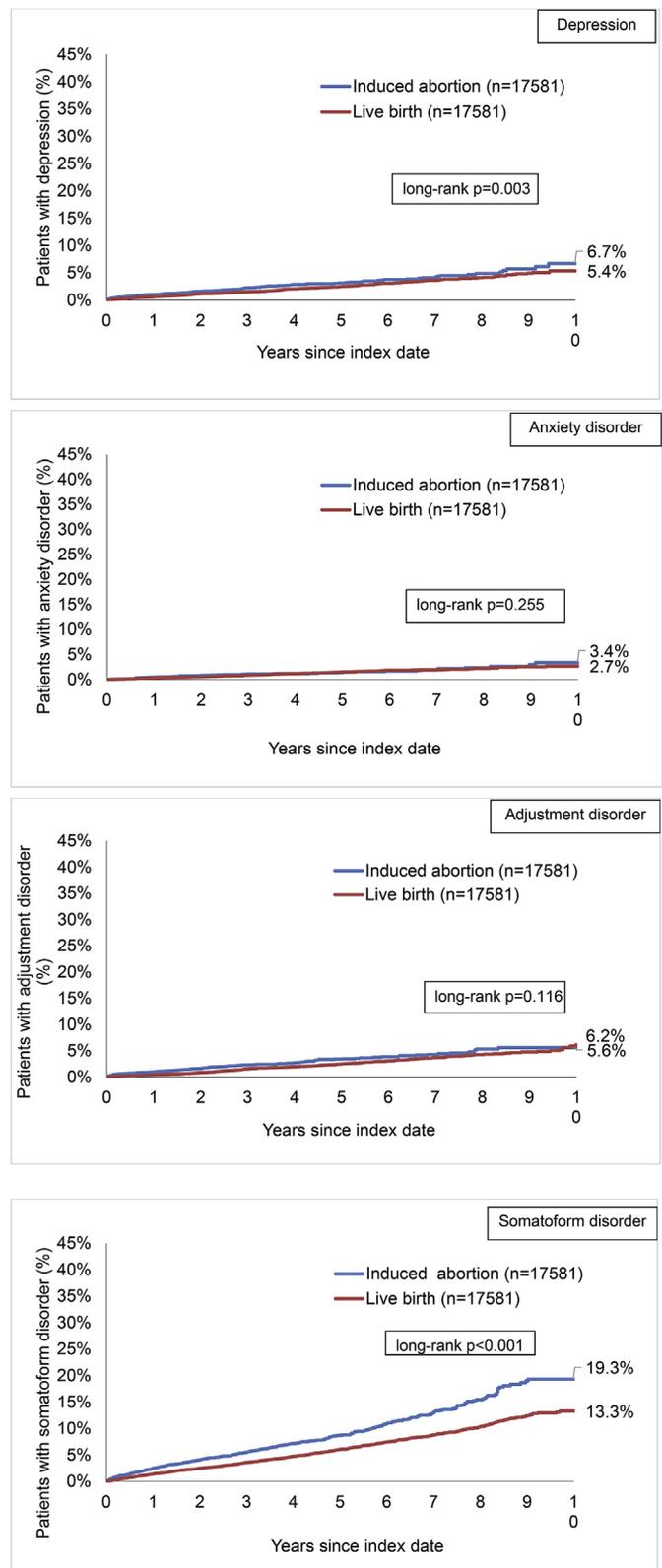

Fig. 3. Kaplan-Meier curves for the time to diagnosis of psychiatric diseases in women with induced abortions and those with live births in gynecological practices in Germany.

Declaration of conflicts of interest

The authors declare that they have no potential conflicts of interest with respect to the research, authorship, and/or publication of this

Table 1

Association between induced abortion and the incidence of depression, anxiety disorder, adjustment disorder, and somatoform disorder in gynecological practices in Germany.

	Depression		Anxiety disorder		Adjustment disorder		Somatoform disorder	
	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Total	**1.34 (1.11–1.64)**	**0.003**	1.17 (0.89–1.54)	0.255	**1.45 (1.19–1.76)**	**< 0.001**	**1.56 (1.38–1.76)**	**< 0.001**
Age group (in years)								
≤ 20	0.87 (0.33–2.28)	0.769	0.51 (0.18–1.46)	0.210	0.69 (0.23–2.07)	0.514	1.02 (0.63–1.66)	0.936
21–25	0.97 (0.60–1.57)	0.905	0.65 (0.34–1.24)	0.194	0.94 (0.58–1.51)	0.787	1.15 (0.89–1.49)	0.289
26–30	1.11 (0.72–1.71)	0.649	1.32 (0.76–2.31)	0.327	1.28 (0.84–1.97)	0.252	**1.42 (1.05–1.93)**	**0.025**
31–35	1.52 (0.97–2.39)	0.067	**2.09 (1.17–3.72)**	**0.012**	**1.96 (1.33–2.89)**	**< 0.001**	**1.68 (1.30–2.16)**	**< 0.001**
36–40	1.48 (0.99–2.23)	0.059	1.08 (0.52–2.25)	0.828	**1.83 (1.16–2.88)**	**0.009**	**1.82 (1.39–2.38)**	**< 0.001**
41–45	**2.29 (1.35–3.86)**	**0.002**	1.39 (0.63–3.07)	0.414	**1.90 (1.11–3.24)**	**0.019**	**2.10 (1.51–2.89)**	**< 0.001**

Abbreviations: HR hazard ratio; CI confidence interval.

article.

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