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Review

Placenta previa after prior abortion: a meta-analysis

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Abstract

There is controversy regarding the role of prior abortion on placenta previa in subsequent pregnancies. We conducted an updated, comprehensive meta-analysis of placenta previa after prior abortion. The search was conducted from PubMed, Web of Science and Scopus databases from the database inception to January 31, 2017. The heterogeneity across studies was evaluated by Q-test and I^2 statistical test. Publication bias was assessed by Begg's test and Egger's test. Results of odds ratio (OR) estimates with their corresponding 95% confidence intervals (CI) were pooled using random-effects modeling. The literature search included 872 articles up until January 2017 with 2,134,529 participants. Based on OR estimates obtained from case-control and cohort studies, we found a significant association between prior spontaneous abortions and placenta previa (1.77; 95% CI: 1.60, 1.94) and between prior induced abortions and placenta previa (1.36; 95% CI: 1.02, 1.69). The meta-analysis study herein showed that prior abortion is a risk factor for placenta previa.

Keywords

Induced abortion, meta-analysis, placenta previa, spontaneous abortion

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Introduction

Placenta previa is defined as the implantation of the placenta in the lower segment of the uterus. It occurs in 3 out of every 1000 pregnancies (Findeklee and Costa, 2015). The risk factors for placenta previa are smoking, previous cesarean sections, advanced maternal age, multiparity and conception by in

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vitro fertilization (IVF) (Shobeiri et al., 2017). Abortions have been proposed to be associated with fetal pathology, congenital abnormality, low birth weight and preterm labor in subsequent pregnancies (Kashanian et al., 2006).

There is controversy regarding the role of prior abortion on placenta previa in subsequent pregnancies. Some studies have reported an increased risk of placenta previa following abortions (Chelmow et al., 1996; Eniola et al., 2002; Handler et al., 1994; Newton et al., 1984; ROSE and CHAPMAN, 1986; Thom et al., 1992), while others saw no correlation (Bakshi et al., 2015; Kashanian et al., 2006; Latif et al., 2015; Usta et al., 2005).

Two previous meta-analyses have shown a positive association between previous abortion(s) and placenta previa in subsequent pregnancies (Ananth et al., 1997a; Faiz and Ananth, 2003). However, such studies have encountered limitations, such as the limited number of primary databases. Thus, in this study, we performed meta-analysis, based on a larger number of subjects and databases to screen, to address the association of previous abortions and placenta previa. Thus, we conducted an updated and comprehensive meta-analysis of the placenta previa after previous abortion(s).

Materials-Methods

The present meta-analysis study was conducted based on the PRISMA guidelines.

Criteria for including studies

Observational studies (cross-sectional, retrospective and prospective studies) were included in participants declared development of placenta previa following a spontaneous or induced abortion. The following were factors which were excluded in the analysis based on the following criteria: placenta previa following abortion (spontaneous or induced), case report studies, review articles, editorials, and letters or miscellaneous in which full data was not accessible following request from the primary or corresponding authors. The factor of interest was abortion (spontaneous and induced) and the outcome of interest was placenta previa.

Search methods

Two independent authors searched PubMed, Medline and Scopus databases from their time of inception to January 31, 2017. The search terms were conducted based on the following: (placenta previa) and (miscarriage OR induced abortion OR spontaneous abortion OR elective abortion).

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After initial evaluation, the studies were independently and carefully evaluated by two authors, and data extraction was performed according to the selection criteria. We extracted the following variables: first author, year of publication, survey years, study country, total sample size, and odds ratio (OR) and their associated 95% confidence intervals (CI). Where discrepancies existed, discussions took place between the two authors until a consensus could be reached.

We assessed the methodological quality of each study independently by two authors via the Newcastle Ottawa Statement Manual (NOS) scale (Wells et al., 2012). The scale was from 0 to a maximum of nine stars, and included the following evaluation criteria: selection, comparability, exposure and outcome. Articles scored with seven stars or more were considered high-quality; articles scored with lower stars were considered low-quality (Poorolajal and Jenabi, 2016).

Heterogeneity and publication bias

Statistical heterogeneity was determined by the Q statistic test, which was quantified by the I-square values for assessing inconsistency across the studies (Higgins et al., 2003). Funnel plot and the Begg's and Egger's tests (Begg and Mazumdar, 1994) were used to evaluate the probability of publication bias. Data were analyzed and the outcomes were reported using the random effect model (DerSimonian and Laird, 1986). The Stata software, version 13 (StataCorp, College Station, TX) was used for statistical analysis; a statistical significance was set at $p< 0.05$.

Results

Description of studies

Our search yielded 872 publications of which 20 studies included met inclusion criteria until Jan 2017 **(Fig. 1)**. We found 3 cohort studies (Bakshi et al., 2015; Kashanian et al., 2006; Rosenberg et al., 2011) and 17 case-control studies (Chelmow et al., 1996; Eniola et al., 2002; Handler et al., 1994; Hung et al., 2007; Johnson et al., 2003; Kramer et al., 1991; Latif et al., 2015; Macones et al., 1997; Newton et al., 1984; ROSE and CHAPMAN, 1986; Sheiner et al., 2001; Shobeiri et al., 2017; Sumigama et al., 2014; Taylor et al., 1994; Thom et al., 1992; Usta et al., 2005; Williams et al., 1991) with 2,134,529 participants. All studies were published in English **(Table 1)**.

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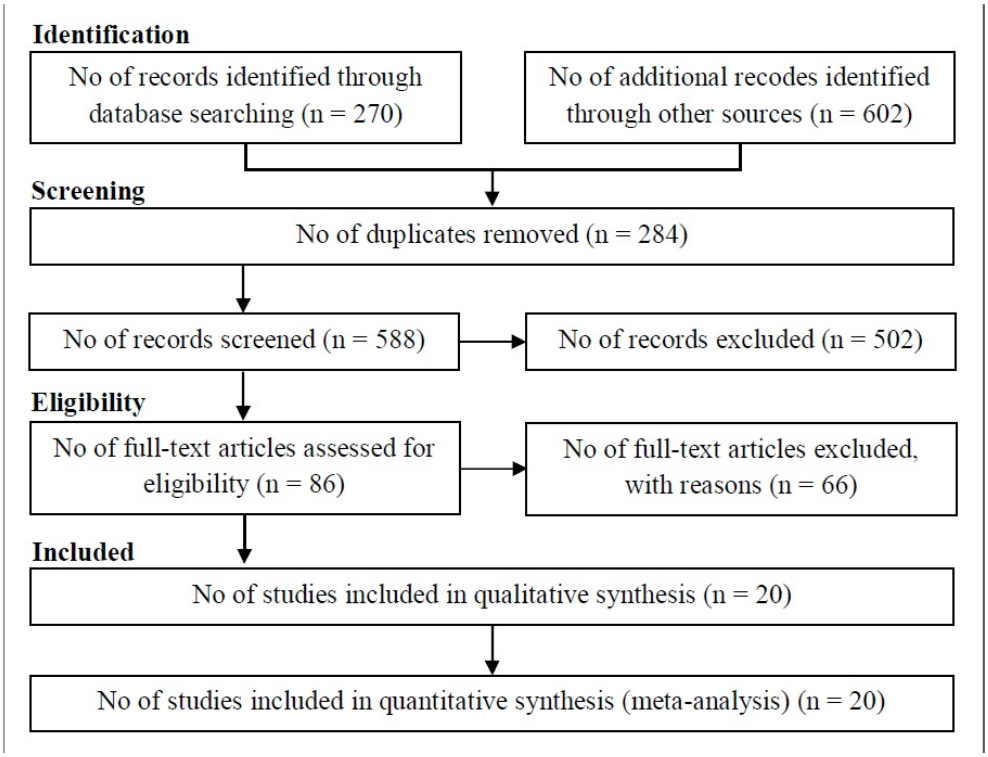

Figure 1. Flow of information through the different phases of the systematic review

Effects of exposure

In the present meta-analysis, the association between prior abortion and risk of placenta previa was based on observational studies (Fig. 2). Based on OR estimates obtained from case-control and cohort studies, there was a significant association between prior spontaneous abortion and the risk of placenta previa (1.77; 95% CI: 1.60, 1.94) and between prior induced abortion and the risk of placenta previa (1.36; 95% CI: 1.02, 1.69). The results indicated that the measure of the effect was homogenous.

Publication bias

The graphical funnel plots appeared to be symmetrical (Fig. 3). The Begg's (z = 0.90, P = 0.366) and Egger's test (t = 0.81, P = 0.428) indicated there was no evidence for publication bias.

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Table 1. Summary of the study results

1st author, Year	Country	Design	Sample	Estimate	Adjustment	Type of abortion	Quality
Rose 1986	USA	Case-control	160	OR	Crude	Spontaneous	Low
Macones 1997	USA	Case-control	240	OR	Adjusted	Induced	High
Chelmow 1996	USA	Case-control	128	OR	Crude	Spontaneous/induced	Low
Newton 1984	USA	Case-control	276	OR	Crude	Spontaneous/induced	Low
Thom 1992	USA	Case-control	5883	OR	Crude	Spontaneous	Low
Williams 1991	USA	Case-control	12420	OR	Adjusted	Spontaneous/induced	High
Hung 2006	Taiwan	Case-control	37702	OR	Crude	Induced	High
Handler 1994	USA	Case-control	3036	OR	Crude	Spontaneous/induced	Low
Johnson 2003	USA	Case-control	814	OR	Adjusted	Induced	High
Kramer 1991	USA	Case-control	3020	OR	Crude	Spontaneous	Low
Usta 2005	Lebanon	Case-control	347	OR	Crude	Spontaneous	Low
Rosenberg 2011	Israel	Ret-cohort	3216	OR	Crude	Spontaneous	Low
Bakshi 2015	India	Pros-cohort	800	OR	Crude	Spontaneous	Low
Shobeiri 2017	Iran	Case-control	260	OR	Adjusted	Spontaneous	High
Sumigama 2014	Japan	Case-control	98	OR	Crude	Induced	Low
Sheiner 2001	Israel	Case-control	28524	OR	Adjusted	Spontaneous	High
Taylor 1995	USA	Case-control	3727	OR	Crude	Induced	High
Latif 2015	Pakistan	Case-control	90	OR	Crude	Spontaneous	Low
Kashanian 2006	Iran	Pros-cohort	300	OR	Crude	Spontaneous	Low
Eniola 2002	Nigeria	Case-control	272	OR	Crude	Spontaneous/induced	Low

Quality of the studies

In this meta-analysis, seven studies were of high quality and thirteen studies were of low quality, based on the NOS scale (Table 1).

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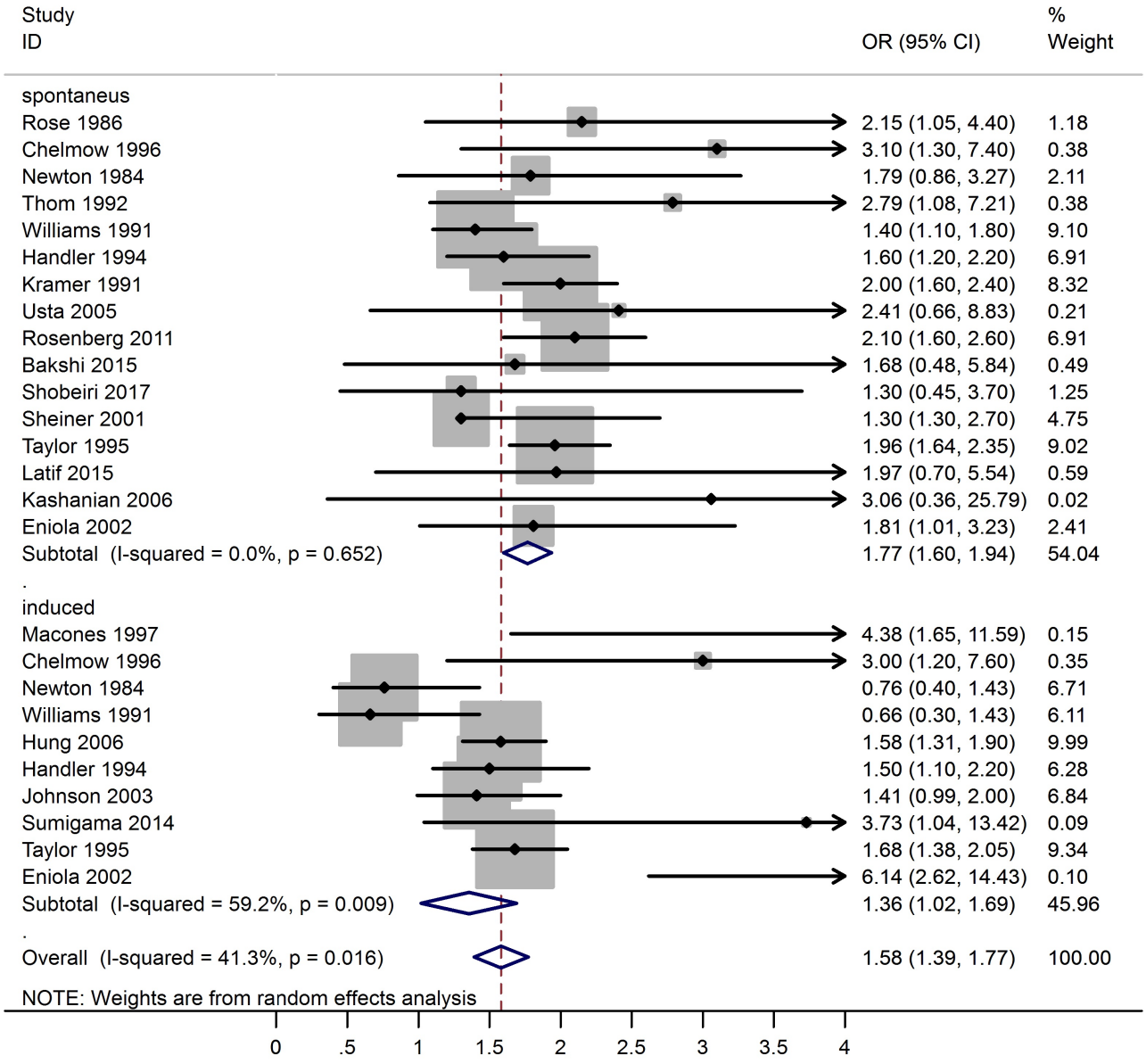

Figure 2. Forest plot of the association between prior abortion and placenta previa.

Discussion

The meta-analysis described herein and based on observational studies show that there is an association between prior abortion and placenta previa. Our results suggest that prior abortion is a risk factor for placenta previa. It has been

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previously reported that placenta previa is correlated with maternal and fetal complication, such as antenatal and post-partum hemorrhage, preterm delivery, intrauterine growth restriction, malpresentation and poor neonatal outcomes (Rombauts et al., 2014).

In a meta-analysis report published by Ananth et al. in 1997 (Ananth et al., 1997b), the authors showed that based on OR estimates from all the studies they evaluated, there was a significant increase in the risk of placenta previa after prior spontaneous abortions (1.7; 95% CI: 1.5, 2.0) and after prior induced abortions (1.5; 95% CI: 1.3, 1.7). However, this meta-analysis was limited to eight studies and they searched only the Medline database.

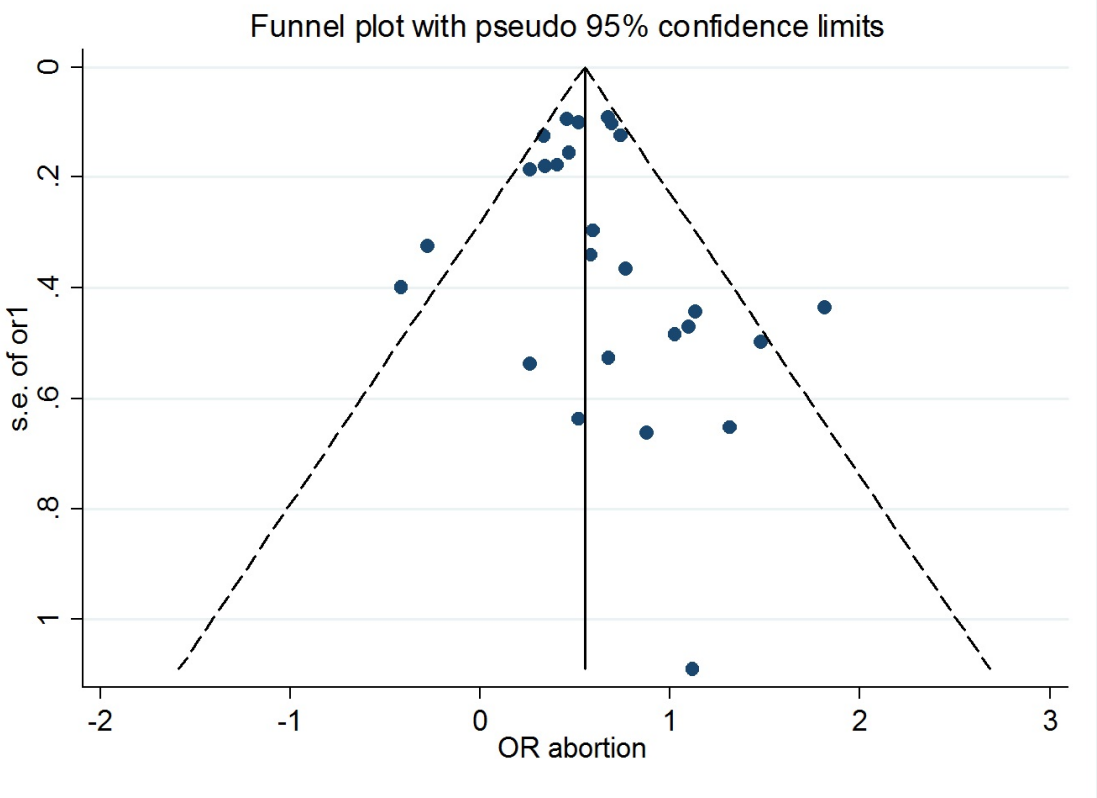

Figure 3. Funnel plot of the association between prior abortion and placenta previa.

In another meta-analysis, conducted in 2003 by Faiz et al. and which evaluated all articles up to year 2000, the authors showed that prior abortion increased the risk of placenta previa. Based on their results, there was significant association in the increased risk of placenta previa after prior spontaneous abortions (2.0; 95% CI: 1.7, 2.3) and after prior induced abortions (1.5; 95% CI: 1.3, 1.9) (Faiz and Ananth, 2003). For their analysis, the authors searched only the Medline database and the meta-analysis included 9 observational studies.

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The mechanisms involved in the association of prior abortions and placenta previa is unknown. The damage and scarring to myometrium and endometrium of the uterus during spontaneous and induced abortions may influence the low implantation of placenta in the uterus in subsequent pregnancies (Faiz and Ananth, 2003).

The meta-analysis described herein had two limitations. While some studies report only the unadjusted form of OR, we tried to use the adjusted form to control for risk factors which may have impacted the studies included in this meta-analysis. However, doing so might introduce information bias in our results. Also, in the present study, we attempted to identify all published studies. However, in spite of our efforts, we could not find two studies that might have reported data on placenta previa. Despite these limitations, the present meta-analysis study was drawn from a large sample size; the 20 studies should efficiently estimate the association between prior abortion and risk of placenta previa. Our results indicate, based on odds ratio reports in epidemiological studies, that prior abortion (spontaneous and induced) can increase the risk of placenta previa.

Conclusion

We showed based on our present meta-analysis of observational studies that prior spontaneous and induced abortions can increase the risk of placenta previa. Therefore, prior abortion is a risk factor for placenta previa.

Author contribution

EJ and MK designed the study and processed the data. MK and EJ performed the statistical analysis. EJ and MK interpreted the results and wrote the first draft. Two authors read and approved the final manuscript.

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