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ORIGINAL ARTICLE

US trends in abortion and preterm birth

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ABSTRACT

Background: A recent large meta-analysis concluded that prior surgical abortion was an independent risk factor for spontaneous preterm birth (PTB), while they found no significant correlation between PTB and medical abortion.

Objective: To evaluate the potential impact of changes in US abortion rates and practices on US incidence of PTB rate.

Study design: This was an epidemiologic analysis of legal abortion and PTB data in the USA from 2003 to 2012. Birth data (annual total birth, annual number and incidence of PTB, defined as PTB <37 weeks) are from National Vital Statistics Reports from the National Center for Health Statistics, Center of Disease Control and Prevention (CDC). Abortion data were collected using Abortion Surveillance provided by the CDC. Abortion incidence was reported overall, and by type: surgical, medical method and procedures reported as "other" such as intrauterine instillation and hysterectomy/hysterotomy. To test for the trend of abortion and of PTB over time, we used the chi-squared test for trend. The primary outcome of our study was the correlation trend analysis between abortion rate and PTB rate. Pearson correlation test was used. A two-tailed p value of 0.05 or less was considered significant.

Results: From 2003 to 2012 there were 41 206 315 births in USA, of which 5 042 982 (12.2%) were <37 weeks. The PTB rate declined significantly from 12.3% in 2003 to 11.5% in 2012 (p value test for trend <.04). Out of the 6 122 649 legal abortions, reported by type of procedure, performed from 2003 to 2012 in USA, 5 132 789 were surgical abortion (82.8%) and 860 288 (14.0%) were medical. Chi-squared test for trend showed that the rate of surgical abortion significantly decreased from 88.9 to 78.0% ($p < .01$) while the rate of medical abortion significantly increased from 7.9 to 21.9% ($p < .01$) from 2003 to 2012, respectively. The rate of PTB was correlated with the rate of medical abortion ($p = .01$) and of surgical abortion ($p = .02$) over time. The higher the surgical abortion rate, the higher the incidence of PTB (Pearson correlation 0.712); the higher the medical abortion rate, the lower the incidence of PTB (Pearson correlation −0.731).

Conclusion: Recent changes in abortion practices may be associated with the current decrease in US incidence of PTB. Further study on the effect of surgical versus medical abortion is warranted regarding a possible effect on the incidence of PTB.

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Abortion; preterm birth; rate

Introduction

Preterm birth (PTB) is the number one cause of perinatal mortality in many countries, including USA [1,2]. Defining risk factors for prediction of PTB is an important goal for several reasons. First, identifying women at risk allows initiation of risk-specific treatment [3,4]. Second, it may define a population useful for studying particular interventions. Finally, it may provide important insights into mechanisms leading to PTB [3].

History of uterine evacuation, by either induced termination of pregnancy (I-TOP) or treatment of spontaneous abortion (SAB) by suction dilation and curettage (D&C) or by dilation and evacuation (D&E), which may involve mechanical and/or osmotic dilatation of the cervix, has been associated with an increased risk of PTB [5]. Two recent meta-analyses [5,6] concluded that prior surgical abortion was an independent risk factor for subsequent PTB. No significant correlation was found in one of these meta-analysis [5] between PTB and medical abortion.

The incidence of PTB has recently declined in USA, from 12.8% in 2006 [based on last menstrual period

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(LMP) dates] to 9.5% in 2014 (based on best estimate dates) [1,7]. Several factors are responsible for this decline, including a reduced teenage birth rate and fewer higher-order multiple births [8]. Also, interventions such as 17 hydroxyprogesterone caproate, vaginal progesterone, and the use of cerclage in selected populations probably are contributing to the reduction in preterm deliveries [8,9].

The aim of this study was to evaluate the potential impact of changes in abortion practices on the incidence of PTB.

Material and methods

We conducted an epidemiologic analysis of legal abortion and PTB data in USA from 2003 to 2012. The year 2012 is the latest year for which US data for abortion data are available. Birth data (annual total birth, annual number and incidence of PTB, defined as PTB <37 weeks) are from National Vital Statistics Reports [6] from the National Center for Health Statistics, Center of Disease Control and Prevention (CDC). Abortion data were collected using Abortion Surveillance provided by the CDC [10]. Abortion incidence was reported by the CDC according to method type: curettage, medical (nonsurgical) abortion, intrauterine instillation, hysterectomy/hysterotomy and procedures reported as "other" or unknown. Curettage was defined as a procedure using surgical instruments for removing the tissue in the uterus; the CDC states that this procedure includes aspiration curettage, suction curettage, manual vacuum aspiration, menstrual extraction, sharp curettage, and D&E procedures. Medical abortion was defined as a nonsurgical uterine evacuation in which pharmaceutical drugs are used to empty the uterus. The CDC states that medical abortion ≤8 weeks of gestation was performed with administration of medication or medications (typically mifepristone followed by misoprostol); while to induce an abortion at >8 weeks typically vaginal prostaglandins are administered. The CDC states that all other methods were uncommon with an incidence of 0.01–1.1% for the entire period during 2003–2012. Intrauterine instillations reported ≤12 weeks have not been included by the CDC. All gestational ages at the time of abortion were included. Illegal induced abortions were excluded from the analysis.

Statistical analysis was performed using SPSS v. 19.0 (IBM Inc., Armonk, NY). To test for the trend of abortion and of PTB over time, we used the chi-squared test for trend. The primary outcome of our study was the correlation trend analysis between abortion rate and the incidence of PTB. Pearson correlation test was used and the scatter plot assessed. A two-tailed p value of ≤0.05 was considered significant. The data analysis was completed independently by two professional statisticians (B.S., M.S.). The completed analyses were then compared and any differences were resolved with review of the entire data and discussion with a third author (G.S.).

Table 1. Distribution of total births and PTBs by all races and all ages in USA from 2003 to 2012 [1].

Year	Births	PTB (*n*)	PTB (%)[a]
2003	4 089 950	499 008	12.33
2004	4 112 052	508 356	12.49
2005	4 138 349	522 913	12.73
2006	4 265 555	542 893	12.80
2007	4 316 233	546 602	12.68
2008	4 247 694	523 033	12.33
2009	4 130 665	502 306	12.18
2010	3 999 386	478 790	11.99
2011	3 953 590	463 163	11.73
2012	3 952 841	455 918	11.55
Total	41 206 315	5 042 982	12.2

[a]PTB <37 weeks.

Results

From 2003 to 2012 there were 41 206 315 births in USA, of which 5 042 982 (12.2%) were preterm. The PTB rate declined significantly from the 12.3% in 2003 to the 11.5% in 2012 (p value test for trend 0.04) (Table 1, Figure 1). The number of legal abortions, reported by type of procedure, declined from the 699 548 in 2003 to the 534 119 performed in 2012. Out of the 6 122 649 legal abortions, reported by type of procedure, performed from 2003 to 2012 in USA, 5 132 789 were surgical abortions (82.8%) and 860 288 (14.0%) were medical abortions. Chi-squared test for trend showed that the rate of surgical abortion significantly decreased over time from 88.9 to 78.0% ($p < .01$) and the rate of medical abortion significantly increased over time from 7.9 to 21.9% ($p < .01$). Rate of abortion defined as "other" and as "unknown" remained stable ($p = .23$ and .79, respectively) (Table 2, Figure 1). Table 3 shows the results of the Pearson correlation analysis between abortion and PTB. The rate of PTB was statistically significant correlated with the rate of medical abortion ($p = .01$) and of surgical abortion ($p = .02$) over time. The higher the surgical abortion rate (curettage), the higher the PTB rate (Pearson correlation 0.712; $p = .032$); the higher the medical abortion rate, the lower the PTB rate (Pearson correlation = −0.731; $p = .013$).

Comment

This epidemiologic study, evaluating the potential impact of changes in abortion practices on PTB rate,

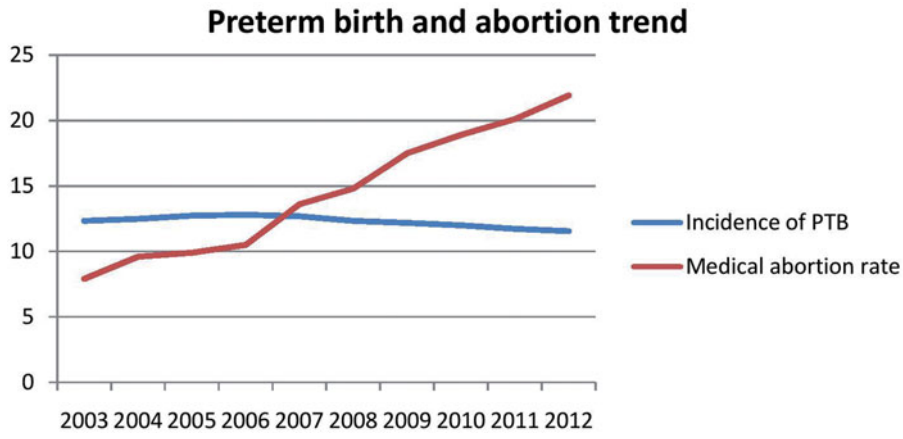

Figure 1. Incidence of preterm birth and rate of medical abortion in the United States from 2003 to 2012. Blue line, incidence of preterm birth; red line, medical abortion rate.

Table 2. Reported legal abortions by type of procedure in USA [10].

Year	Curettage	Medical	Other[a]	Unknown	Total abortions
2003	622 257 (88.9%)	55 408 (7.9%)	13 631 (1.9%)	8252 (1.3%)	699 548
2004[b]	600 724 (87.1%)	66 033 (9.6%)	12 795 (1.9%)	9532 (1.4%)	689 084
2005[b]	544 634 (81.4%)	66 485 (9.9%)	19 090 (2.9%)	38 453 (5.8%)	668 662
2006[b]	597 216 (86.7%)	72 403 (10.5%)	12 291 (1.8%)	6949 (1.0%)	688 859
2007	460 555 (86.3%)	71 238 (13.6%)	2061 (0.1%)	–	533 854
2008	488 681 (84.6%)	85 520 (14.8%)	3418 (0.6%)	–	577 619
2009	486 416 (82.1%)	103 341 (17.5%)	2439 (0.4%)	–	591 111
2010	465 987 (80.6%)	109 221 (18.9%)	3239 (0.5%)	–	577 088
2011	448 104 (79.5%)	113 132 (20.1%)	2100 (0.4%)	–	562 705
2012	418 215 (78.0%)	117 507 (21.9%)	225 (0.1%)	–	534 119
Total	5 132 789 (82.8%)	860 288 (14.0%)	71 289 (1.2%)	63 186 (2.0%)	6 122 649

[a]Includes intrauterine instillations, hysterotomy/hysterectomy and procedures reported as "other".
[b]Total do not include very small numbers as per CDC.

Table 3. Pearson correlation analysis between abortion and PTB.

Abortion type	Pearson correlation (PTB)	*p* value
Curettage	0.712	**.032**
Medical	−0.731	**.013**

Boldface denotes statistically significant values.

showed that from 2003 to 2012 the incidence of PTB as well as the legal abortion rate significantly decreased. Correlation analysis found that the incidence of PTB was inversely proportional to the rate of medical abortion and directly proportional to the rate of surgical abortion.

This study was limited by the quality of the included data. PTB data referred to both spontaneous and indicated PTB. The fact that many variables are missing and that the data were not specifically collected to answer the question does not allow for meaningful interpretation and generalization of the results. The analysis included only aggregate data, therefore performing subgroup analyses in certain risk groups was not feasible.

We could not identify other studies correlating abortion rates to the incidence of PTB using USA national data. A meta-analysis of published epidemiologic studies concluded that prior surgical abortion for either I-TOP or SAB was an independent risk factor for spontaneous PTB, while no significant correlation was found between PTB and medical abortion, consistent with our findings [5]. One of the strengths of our study is the inclusion of large and high-quality data from CDC [1,10]. Limitations of our study are inherent to the data included. Data regarding PTB referred to both spontaneous and indicated as etiology of PTB. Our analysis of the PTB and abortion time trends was constrained by the limited availability of trend data for PTB and for abortion rates at national level [1,10]. No demographics were available regarding other risk factors for PTB. It is possible that other confounding variables could have been responsible for the decrease in PTB including a reduced teenage birth rate, fewer higher-order multiple births, interventions such as 17 hydroxyprogesterone caproate, vaginal progesterone and the use of cerclage in selected populations [8,9].

In 2008, the unintended pregnancy rate was 51% and in 2011 it was 45% [11]. Interestingly, these dates seem to correlate with when the PTB rate starts to

decline. There is an issue of temporality in our data, as changes in abortion rate could have a time lag before changes in PTB rate are seen to occur. Moreover, the abortions occurred in a set of women, while PTB probably occurred mostly in a different population.

Different strategies have been adopted for prevention of PTB [8]. It is possible that findings from this epidemiologic analysis could lead to a new strategy in prevention of PTB by a change in abortion procedures. There are many methods for abortion [5,12–17]. The procedure used depends in part on the gestational age and the size of the fetus. In the first trimester of pregnancy abortion procedures could be performed by either surgical approach or medical approach. Suction D&C may be used to evacuate the uterus up to 16 weeks of gestation. This is still the most common way to evacuate the uterus in the developed world [5]. Ashok et al. [12] in a randomized controlled trial concluded that medical abortion with mifepristone 200 mg followed by misoprostol up to three doses, was safe and effective at 10–13-week gestation and should be considered an option for those women who wish to avoid surgery and anesthesia. In the second trimester of pregnancy, medical approach can also provide a safe and cost effective technique for uterine evacuation [13].

Dilatation of the cervix is required during surgical methods of abortion. In contrast to normal birth, during which the dilation occurs slowly over a period of many hours, during a surgical abortion, the cervix is usually mechanically stretched acutely [14–16]. This stretching of the cervix may result in permanent physical injury to the cervix [5]. Osmotic dilators such as laminaria may, and probably should, be used to reduce the need for mechanical dilation [5]. Osmotic dilators are inserted into the cervix prior to the procedure, and they absorb water and swell, gradually stretching the cervix open [5,15,16]. More research is needed to evaluate if such cervical ripening prevents any long-term effects of surgical abortion on later PTB.

The biological plausibility to explain the higher risk of PTB in women with prior surgical abortion is not completely clear [5]. However, the increased risk could result from the overt or covert infection following surgically uterine evacuation, as well as from mechanical trauma to the cervix, leading to increased risk of cervical insufficiency.

In conclusion, changes in abortion practices may be responsible for the recent decrease in the PTB rate in USA. These data warrant further research in the correlation of surgical or medical uterine evacuation for abortion and the subsequent risk of PTB.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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