Clinical Communications

Antibiotics for respiratory infections during pregnancy: prevalence and risk factors

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Clinical Implications

- In this retrospective observational cohort, women were less likely to receive antibiotics for upper respiratory infections during pregnancy, compared with the year before or after pregnancy. Maternal asthma, rhinitis, and sinusitis appeared to be risk factors for needing antibiotics during pregnancy.

TO THE EDITOR:

Studies to date demonstrate that pregnant women are at an increased risk for respiratory viral infections including influenza A (H1N1)[1] and rhinovirus.[2] Pregnant women with asthma have an even higher risk of respiratory viral infections than non-asthmatic women with more severe symptoms.[3] These infections may be complicated by bronchitis, bacterial pneumonia, and bacterial sinusitis all of which may have adverse effects on both mother and baby. Sorri et al[4] reported that pregnant women were at increased risk of developing bacterial sinusitis often presenting with atypical symptoms. However, Sobol et al[5] did not confirm an increased prevalence of sinusitis in pregnant women compared with controls.

The aims of our retrospective observational study were (1) to determine if the diagnoses of upper respiratory infections or sinusitis are more common during pregnancy compared with the year before and the year after pregnancy, (2) to determine if women are more likely to receive antibiotics for respiratory infections or specifically sinusitis during pregnancy compared with the year before and the year after pregnancy, and (3) to determine if asthma, chronic rhinitis, and chronic sinusitis are associated with an increased risk of antibiotic use during pregnancy.

A sample of pregnant women giving live births and fulfilling inclusion criteria was formed from the Kaiser Permanente Research Data Warehouse. Information on outpatient pharmacy as well as clinic visits was extracted. Inclusion criteria were (1) pregnant women delivering live births between 2001 and 2010 and (2) continuous Kaiser Permanente health plan enrollment and pharmacy benefit during the year before pregnancy, during pregnancy, and during the year after delivery. Pregnant women with coexisting diagnoses of immune deficiency, active autoimmune disorder, current immunosuppressant therapy, chronic antibiotic therapy, or cystic fibrosis were excluded from the study. For women who had multiple pregnancies during the study period, 1 pregnancy was randomly selected.

An antibiotic course for an upper respiratory infection was defined as dispensing of any antibiotic prescriptions within 3 days of an encounter coded as an upper respiratory infection (ICD.9 460-466 and 473, excluding 464.3 and 464.4). Different antibiotics prescribed within 3 weeks of each other were considered to be for the same infection and counted as 1 antibiotic course. Other clinical outcomes assessed included (1) any encounter for an upper respiratory infection, (2) an encounter with a diagnosis of acute or unspecified sinusitis and chronic sinusitis, and (3) antibiotic dispensing within 3 days of a sinusitis encounter. All outcomes were compared during 3 time periods: (1) pregnancy (based on delivery date and gestational age at delivery), (2) same period of time in the year before pregnancy, and (3) same period of time in the year after delivery. Other information captured from the computerized records included (1) age, (2) parity, (3) race/ethnicity, (4) MediCAL(Medicaid) or other State programs, (5) encounter diagnoses of comorbidities (asthma, chronic rhinitis, chronic sinusitis), (6) smoking status during pregnancy, collected from both the State birth certificates and clinic visits during pregnancy, and (7) geocoded median household income and education among residents at 25 years of age at the census block group level. The income and education estimates came from Nielson (www.nielson.com).

Descriptive analyses included frequencies and percentages to describe the patients. Univariable modified Poisson regression was applied to compare the risks of the outcomes of interest in the years before, during, and after pregnancy. Because of the correlation among the 3 measures per person (before, during, and after pregnancy), generalized estimating equations were used to account for the clustering.[1,2] The crude risk ratios (RR), their 95% confidence intervals (CI), and the *P* values were reported. To evaluate the potential effects of the comorbidities and smoking status during pregnancy on the risk of an antibiotic for an upper respiratory infection during pregnancy, adjusting for patient demographic status, the multivariable modified Poisson regression model was applied.[4] The crude and adjusted RR and their 95% CI were reported. All analyses were conducted using SAS 9.3.

A total of 103,129 pregnant women who gave live births during or between 2001 and 2010, continuously enrolled for the year before, during, and after the pregnancies, were eligible for the study. Characteristics of these women are shown in Tables E1 and E2 in this article's Online Repository at www.jaci-inpractice.org.

The proportion of acute respiratory infections treated with antibiotics was significantly higher in the year before and after pregnancy compared with during pregnancy (relative risk 1.31 (1.27, 1.35) and 1.37 (1.34, 1.41,), respectively) (Table I). Although the risk of an encounter for any upper respiratory infections during pregnancy was not different than the year before pregnancy, the risk appeared only slightly significantly higher in the year after pregnancy (Table I) (1.05 (1.03, 1.07)). Similarly, the risk of an encounter for sinusitis during pregnancy was not significantly different from the year before pregnancy, but there was a 53% increased risk in the year after pregnancy compared with pregnancy (Table I). In contrast, the risk of encounter diagnoses of sinusitis and antibiotic treatment for sinusitis was higher both the year before and the year after pregnancy compared with during pregnancy (Table I). Although there were multiple statistically significant differences in these comparisons due to the large sample size, the differences do not appear to be clinically meaningful. However, the important observation is that

TABLE I. Counts and percentages of antibiotic use for acute respiratory infections and sinusitis before, after, and during pregnancy, and crude risk ratios (95% confidence intervals [CI])

Outcome	Year before pregnancy	During pregnancy	Year after pregnancy	Risk ratio (95% CI)	
				Year before vs during pregnancy	Year after vs during pregnancy
Antibiotic treatment for acute upper respiratory infection, n (%)	9,497 (9.2)	7,261 (7.0)	9,966 (9.6)	1.31 (1.27, 1.35)	1.37 (1.34, 1.41)
Any acute upper respiratory infection, n (%)	18,283 (17.7)	18,544 (18.0)	19,456 (18.9)	0.97 (0.87, 1.09)	1.05 (1.03, 1.07)
Chronic sinusitis encounter, n (%)	1,380 (1.3)	1,260 (1.2)	1,924 (1.9)	1.05 (0.79, 1.38)	1.53 (1.43, 1.64)
Acute sinusitis encounter, n (%)	4,781 (4.6)	4,156 (4.0)	5,490 (5.3)	1.14 (1.07, 1.20)	1.32 (1.28, 1.37)
Antibiotic treatment for sinusitis, n (%)	3,495 (3.4)	3,265 (3.2)	4,204 (4.1)	1.07 (1.02, 1.12)	1.29 (1.24, 1.35)

TABLE II. Crude and adjusted risk ratios (95% confidence interval [CI]) of antibiotic treatment for upper respiratory infection during pregnancy

Comorbidity	Antibiotic treatment for acute URI	
	Risk ratio (95% CI)	
	Univariate	Multivariate*
Asthma before pregnancy		
No (N = 100,162)	ref	ref
Yes (N = 2,967)	2.49 (2.29, 2.70)	2.45 (2.26, 2.67)
Rhinitis before pregnancy		
No (N = 98,863)	ref	ref
Yes (N = 4,266)	1.89 (1.74, 2.05)	1.91 (1.76, 2.07)
Chronic sinusitis before pregnancy		
No (N = 101,749)	ref	ref
Yes (N = 1,380)	2.66 (2.37, 2.98)	2.53 (2.26, 2.84)
Smoking during pregnancy		
No (N = 97,634)	ref	ref
Yes (N = 5,495)	1.08 (1.03, 1.12)	1.07 (1.03, 1.11)

URI, Upper respiratory infection.
*Model adjusted for age, ethnicity, geocoded median household income, and Medicaid insurance.

no increase in any of these outcomes was seen during pregnancy compared with before or after pregnancy.

After adjusting for demographic factors, a diagnosis of asthma, rhinitis, or chronic sinusitis was associated with a nearly 2- to 2.5-fold increase of the risk of antibiotic administration for an upper respiratory infection during pregnancy (Table II). In contrast, smoking only marginally increased the risk (odds ratio = 1.07, 95% CI 1.03-1.11).

This study did not confirm the prior assertion that sinusitis or antibiotic use for upper respiratory infections is increased in pregnancy. We did find that respiratory comorbidities increased the risk of antibiotic use during pregnancy. The strengths of the study include the large numbers, real-world setting, and ability to adjust for confounding demographic variables. In addition, using pregnant women as their own controls (during the year before and the year after pregnancy) should have reduced the effects of unmeasured confounders. However, there are some limitations to our study. Data regarding antibiotic use were obtained from prescriptions dispensed and not from self-report to confirm that patients actually used the dispensed medications. We also did not collect information in regard to the type of antibiotics administered. Despite these limitations, our findings are supported by recent data derived from medical records or self-report. Murphy et al[6] found that 71% of pregnant females with asthma had common cold during pregnancy, compared with 46% of pregnant females without asthma (incidence rate ratio 1.77, 95% CI 1.30-2.42), as determined by self-report and validated questionnaire. Two other studies confirm a relationship between maternal asthma and increased upper respiratory tract infections during pregnancy[7] and increased antibiotics for upper respiratory tract infections during pregnancy.[8]

In summary, our findings show that, although there was no significant increase in use of antibiotics for upper respiratory infections during pregnancy in this cohort of women, maternal asthma, rhinitis, and sinusitis appeared to be risk factors for needing antibiotics during pregnancy.

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