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The relationship between total fibroid burden and first trimester bleeding and pain

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Abstract

Background—Few studies comment on the association between fibroids and symptoms among pregnant women. These studies generally are retrospective and do not to assess the influence of number of tumors or their volume on risk of symptoms.

Methods—*Right from the Start* is a prospective cohort that enrolled pregnant women from the southeastern United States between 2000 and 2012. In the first trimester, all participants had standardized ultrasounds to determine the presence or absence of fibroids. Symptoms were queried in a telephone survey. We used polytomous logistic regression to model odds of bleeding, pain, or both symptoms in relation to increasing total fibroid number and volume among white and black women.

Results—Among 4,509 participants, the prevalence of fibroids was 11%. Among those reporting symptoms (70%), 11% reported only bleeding, 59% reported only pain, and 30% reported both symptoms. After adjusting for age, race, parity, hypertension, smoking, alcohol use, and study site, increasing number of fibroids was associated with pain (odds ratio (OR) 1.16, 95% confidence interval [1.00, 1.33]) and both symptoms (OR 1.25 [95% CI 1.08, 1.45]), but not with bleeding among all women. Fibroid volume was not associated with symptoms among black women, but white women with the smallest fibroid volumes were more likely to report both symptoms than those without fibroids (OR 1.79 [95% CI 1.17, 2.72]).

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Conclusions—Very large tumors are not requisite for experiencing symptoms, as small fibroids and increasing number of tumors are associated with pain and both symptoms.

Keywords

Leiomyoma; pregnancy; prospective studies; uterine hemorrhage; pain

Introduction

Fibroids are consistently described as causing heavy or irregular menstrual bleeding and pelvic pressure or pain.^{1,2} In early pregnancy, bleeding and pain concern women because they can be a warning of miscarriage or ectopic pregnancy.³ Several studies have explored the associations between fibroids and these symptoms among pregnant women, but to our knowledge, only three have commented on the influence of fibroid disease severity (number of tumors or volume) on risk of symptoms.^{1,2,4,5,6} In retrospective hospital chart reviews—used in most of these studies—symptom information may be inconsistently documented (e.g., only pain requiring narcotics is recorded) and populations may be biased by selection of women with “problematic” or larger fibroids. The experiences of the majority of women with fibroids are likely not represented by these study populations.

The three studies commenting on fibroid burden and symptoms in pregnancy dichotomized their measures of disease severity (e.g., whether or not a woman had a tumor larger or smaller than five centimeters (cm) in diameter).^{2,4,5} Increasing number or size of tumors may correspond to a linear or even monotonic increase in fibroid “severity,” but the literature does not support this assumption. Under a linear or monotonic scenario, larger total fibroid volumes would contribute to greater likelihood of pain or pressure—especially in pregnant women—as a larger uterus puts pressure on the surrounding organs and blood vessels.⁷ Numerous or large fibroids may interfere with muscle contractility or reorganize blood flow within the uterus as well, contributing to bleeding and pain. Though an appealing and plausible concept, treating number of fibroids or total volume as a continuous measure can be complicated by skewness and overdispersion, as most women will have very few or very small fibroids, but some will have large fibroids. Research is needed to determine whether continuous measures of tumor burden have monotonic or simple linear relationships with increasing risk of bleeding or pain and to estimate the magnitude of the associations in a community-recruited pregnant population.

Another limitation of studies exploring fibroid-associated symptoms in pregnancy is that many are done among populations with minimal diversity or little representation from black women. Black women are more likely to have fibroids than white women and generally have more numerous and larger tumors and fibroid diagnoses at younger ages.⁸⁻⁹ It is also possible that black women with fibroids have different anxieties or expectations about their fibroids or report symptoms such as bleeding or pain differently than white women with fibroids.

For our analyses, we examined the associations between number of tumors or total fibroid volume and first trimester vaginal bleeding and abdominal pain in a prospective, community-based pregnancy cohort, *Right from the Start* (RFTS). We examined the

potential for both linear and non-linear associations, as well as effect modification by maternal race.

Material and Methods

Study Population

RFTS is a prospective cohort study that recruited women from communities in North Carolina, Texas, and Tennessee from 2000-2012; women contributing information to these analyses were enrolled in or before 2011.¹⁰ The study enrolled women who were newly pregnant or trying to become pregnant, were at least 18 years old, less than 13 weeks pregnant, spoke English or Spanish, planned to carry to term, identified a prenatal care provider, and did not use fertility treatments to conceive.¹⁰

All women in RFTS were screened for the presence or absence of fibroids in the first trimester. Sonographers determined fibroid status during first trimester transvaginal ultrasounds (targeted for the sixth week of gestation, median time was 8 weeks with a range of 5-16). The position, type, and size of all fibroids, as small as 0.5cm in maximum diameter, were noted by the sonographers and confirmed by a study physician.⁸ Three diameter measurements were used to calculate fibroid volume (in cubic centimeters, cc) using the formula for an ellipsoid ($\text{volume} = (4/3) * \pi * \text{radius 1} * \text{radius 2} * \text{radius 3}$). Fibroid location within the uterus was defined as follows: fundus, corpus, cervix, anterior, and posterior. Fibroid types included: submucous distorting the endometrium, submucous not distorting the endometrium, intramural, subserosal (distorting the serosal surface), and pedunculated. Categories for type were mutually exclusive. Overall ultrasound findings, including fibroid measures, were sent to the participants' healthcare providers. Study personnel, including sonographers, did not discuss the results with the participants.

Participants completed a one-hour first trimester computer-assisted telephone interview targeted for 13 weeks gestation. This interview included questions about demographics and menstrual and pregnancy history. Women were also queried about pain and bleeding experiences and health behaviors. For bleeding, women were asked if they had any bleeding or spotting since becoming pregnant and when that bleeding began, how long it lasted, and how heavy it was. As necessary, multiple episodes were recorded. Additionally, women were asked if they had any abdominal pain or cramping since their last menstrual period and when it first began. Maternal body mass index (BMI) was calculated from standardized height and weight measurements obtained at the first trimester ultrasound visit.

There were 5,759 unique participants with pregnancies meeting study enrollment requirements. Other exclusion criteria included multiple gestations (n=60), no study ultrasound (n=314), missing volume information for fibroids documented during the ultrasound (n=2), no first trimester interview (n=282), and missing responses to bleeding or pain questions (n=27). Due to small sample sizes among other ethnic/race groups, we limited analyses to non-Hispanic white and non-Hispanic black women (n=565 excluded). The resulting population of 4,509 women was uniformly screened for the presence or absence of fibroids.

Statistical analysis

Outcomes—The outcomes for this study were grouped as three distinct symptom profiles: only bleeding, only pain, and bleeding and pain in the first trimester. Women who reported both bleeding and pain (referred to as “both symptoms” hereafter) were treated as having a different set of symptoms, separate from those with only bleeding or pain. We evaluated these three symptom profiles as one non-ordinal multinomial (polytomous) outcome.

Exposures and linearity assessment—Two features of fibroid severity or burden were of interest: number of tumors and total fibroid volume. Number of fibroids was a count of all tumors detected. Total fibroid volume was calculated for each woman by summing volumes across her individual tumors.

In order to examine the linearity of the continuous exposure and outcome risk relationships, we plotted predicted values for the log odds of each outcome for each cubic centimeter of total fibroid volume or every possible number of fibroids. We selected modeling approaches for our measures of fibroid severity based on this visual assessment (e.g., looking for a “cigar-shaped” band) and by comparing Akaike’s Information Criterion (AIC), and decided on the allowable model complexity based on degrees of freedom used and parsimony (e.g., preference for linear over quadratic fit of the data given similar AICs).

Number of fibroids was modeled continuously because, unlike total volume, it had linear relationships with the predicted values of each outcome. Continuous total fibroid volume was used for descriptive purposes (Table 1). However, because non-linear relationships with symptoms were detected, a categorical measure was used in analyses to provide interpretable effect estimates: no fibroids (reference), less than or equal to 5cc, more than 5cc and less than or equal to 20cc, and more than 20cc. These cutoff points correspond to the 50th and 75th percentiles for total fibroid volume among the population. The 50th and 75th percentiles of total volume among white women were 3.1 and 12.8cc and among black women they were 10.4 and 30.1cc, respectively.

Effect measure modification—We assessed effect measure modification by maternal race between number of tumors or total fibroid volume and the polytomous symptom outcome. We limited the population to non-Hispanic white and black women due to small sample sizes among other race groups. Regression models with and without an interaction term for race and the exposure of the interest were compared with a likelihood ratio test; a two-sided significance level of 0.1 was used to allow for greater power when testing for heterogeneity (multiplicative interaction). Modification by maternal race was not statistically significant for the effect of number of fibroids ($p=0.246$) or total fibroid volume ($p=0.228$) on the odds of reporting symptoms. However, we report models stratified by race as well as unstratified models.

Confounding—Candidate confounders were selected *a priori* from the literature and included: maternal age (continuous, quadratic), race (reference group=non-Hispanic white), parity (number of prior births; reference=primiparous), BMI (continuous, linear) alcohol use during pregnancy (reference=none), tobacco use during pregnancy (reference=none), any previous diagnoses of hypertension (reference=none), any previous diagnosis of diabetes

(reference=none), and study site (reference=North Carolina). Women with unknown hypertension status were included as a distinct category in regression analyses; after conditioning on completion of our first trimester questionnaire, we felt the large proportion of missingness was not unexpected for reproductive aged women, who may not be concerned about or tested for hypertension until pregnancy. We used data-driven methods to determine a potential confounder's inclusion in our final models: confounders had to be associated with the presence of fibroids (exposure) and with a symptom profile among women without fibroids (outcomes). Among variables meeting both criteria, a change-in-estimate culling criteria was also used to build parsimonious models. All adjusted models included: age, race (unstratified models only), parity, hypertension history, smoking, alcohol use, and study site.

Primary Analyses—Maternal characteristics were compared between women with and without fibroids using chi-square tests ($\alpha=0.05$). Among women with fibroids, fibroid characteristics were compared between those with and without symptoms—using Wilcoxon rank sum tests for continuous variables and chi-square or Fisher exact tests for categorical variables (for cell counts with fewer than five observations).

We generated unadjusted and adjusted odds ratios (OR) and 95% confidence intervals [CI] for the effect of fibroid severity on first trimester symptoms using polytomous logistic regression. Women without fibroids were the reference group for our exposures and women with no symptoms were the reference group for our outcome. All analyses were completed using Stata SE, version 12 (StataCorp LP, College Station, Texas).

Results

Among the 4,509 participants, 484 had one or more fibroids (11%). Women with fibroids, compared to those without, were more likely to be older (>29), black, overweight or obese, and non-smokers. They were also more likely to have a higher household income and to have completed at least four years of college (Table 1).

Approximately 70% of the population experienced symptoms. Among those experiencing symptoms, the most common was only pain (59%), followed by both symptoms (30%), and only bleeding (11%). White and black women had almost identical prevalence of symptoms, which were similar to the symptom prevalence among the entire cohort (results not shown).

No woman had more than seven tumors and total fibroid volume ranged from one to more than 900cc (Table 2). The fibroid prevalence by symptom type was similar: 9% of women with no symptoms had one or more fibroids, 11% of those with only bleeding, 10% of those with only pain, and 14% of those with both symptoms. The distribution of number of tumors or volume generally did not differ between women with and without symptoms. However, women experiencing both symptoms had more than one tumor more often than those reporting no symptoms.

Although small sample sizes prevented us from modeling other fibroid characteristics, secondary analyses show that among women with fibroids, those reporting only bleeding may be less likely to have intramural fibroids (30% versus 45% among those reporting no

symptoms, $p=0.102$; results not shown) as well as fibroids located in the anterior part of the uterus (46% versus 62%, $P=0.074$). Similarly, those reporting pain or both symptoms less often had fibroids located anterior. Reporting both symptoms was associated with a higher prevalence of fibroids in the posterior section of the uterus (59% versus 49%, $P=0.095$). Fibroids in the corpus were found less frequently among women reporting pain or both symptoms compared with those reporting none. Women reporting any symptoms, regardless of type, were more likely to have fibroids in the cervix than women with fibroids reporting no symptoms. In our subsample of RFTS, black women were more likely than white women to have posterior fibroids (63% versus 49%; $P=0.004$), fibroids in the uterine corpus (64% versus 53%, $P=0.014$), and pedunculated fibroids (9% versus 3%, $P=0.008$).

We did not find evidence for associations between only bleeding and increasing fibroid burden (Table 3 and Table 4). The adjusted odds ratio for only bleeding associated with having any fibroids was OR 1.08 [95% CI 0.72, 1.62] (among all women; not shown). When comparing effect estimates across race groups, black women had a greater odds of bleeding than white women when the exposure was number of fibroids or the largest total volume category (not statistically significant). In the fibroid volume models, the odds ratios for all symptoms increased in magnitude along with volume among black women (Table 4).

After adjustment for confounders, having any fibroids was not associated with reporting only pain (OR 1.23 [95% CI 0.95, 1.58], all women). However, increasing number of fibroids was associated (OR 1.16, [95% CI 1.00, 1.33]; Table 3); this estimate was consistent across the stratified models, though not precise. The largest odds ratios for only pain associated with total volume were seen for the smallest volumes among white women (OR 1.31 [95% CI 0.88, 1.95]), but for the largest volumes among black women (OR 1.75 [95% CI 0.82, 3.75]; Table 4).

Finally, we noted an adjusted increased odds ratio for reporting both symptoms associated with having any fibroids (OR 1.39 [95% CI 1.05, 1.84]) and increasing number of fibroids (OR 1.25 [95% CI 1.08, 1.45]) among all women. Among white women, increasing number of fibroids and the lowest total fibroid volumes were associated with both symptoms (OR 1.79 [95% CI 1.17, 2.72]).

Comments

This study is among the first to explore the influence of total number and volume of fibroids on symptoms during pregnancy. RFTS has a unique advantage, namely that fibroid characteristics were uniformly measured across all subjects via research-quality ultrasounds (as opposed to using self-report, clinical databases, or medical record codes) and all women were asked about symptoms. The most common symptom among both white and black women was pain.

Our results show that having even small fibroid volumes is associated with symptoms among white women. Volume and symptoms among black women were not associated, but we cannot rule out the impact of small sample sizes. There also may be factors for which we did not account that uniquely influence bleeding and pain for black women (e.g., fibroid

position or expectations about pain in pregnancy). Among our whole population, we found that that increasing fibroid number most directly influenced the reporting of first trimester pain; increasing number of fibroids increased odds of pain and both pain and bleeding. Increasing number of fibroids may influence risk of experiencing symptoms through fibroid position or type, rather than corresponding to an increase in volume. Interestingly, there was poor correlation (0.2) between fibroid number and volume, even when looking at the racial groups separately.

Black women of reproductive age and during pregnancy are disproportionately affected by fibroids compared to white women.⁸⁻¹¹ Black women are also more likely to have more severe fibroid disease: more numerous and larger tumors and fibroid diagnoses at younger ages.⁸⁻⁹ It is possible that black women with fibroids may have different anxieties or expectations about their fibroids, they may report symptoms differently than white women, or they may use different healthcare options for their symptom management. Previously, Wittels and colleagues reviewed emergency room visits for vaginal bleeding during pregnancy among a nationwide sample of general hospital survey data (1993-2003); they noted higher emergency visitation rates among black and Hispanic women than among white women.¹² Chronic stress, discrimination, affordability of care, or even fibroid experiences of relatives can change how women respond to pain—for example, in how anxious it makes them feel or whether or not they decide to treat it.¹³ Ultimately, both sociocultural and biologic characteristics complicate the relationship between race and symptom reporting, but pregnant black women with fibroids are underrepresented in most studies, which makes inference difficult. Contrary to our expectations, black women in our study did not report more symptoms than white women and did not have symptoms associated with increasing fibroid burden, though a dose-response associated with increasing volume was suggested. We did not assess pain intensity and this could vary by race.

Despite increasing total number of fibroids or volume being thought of clinically as markers of disease severity in pregnancy—due to their associations with increased risks of pregnancy and labor complications—their influence on symptoms such as bleeding or pain is less clear.¹⁴⁻¹⁵ An earlier RFTS analysis suggested any fibroids increased bleeding risk, but did not consider fibroid severity and adjusted for different factors.¹ Another study that used hospital discharge records found an 87% increase in the odds of first trimester bleeding among women with fibroids compared to those without (adjusted for age and weight gain during pregnancy).⁶ Koike and colleagues reviewed medical records from women with fibroids attending a Japanese hospital and compared the prevalence of bleeding in the first trimester between women whose largest fibroid was greater than or equal to six cm (presumed diameter) and those whose largest fibroid was smaller. They reported no significant difference between the groups using a chi-square test.⁵ To our knowledge, this last study was the only to report on bleeding during pregnancy in relation to fibroid size. Our results do not reveal a clear association between fibroid severity and bleeding, suggesting that increasing total number or volume of fibroids is not an important predictor of bleeding or that this relationship is weaker than expected (necessitating larger sample sizes), overly complex, or confounded by unmeasured factors. Indeed, our findings linking fibroid severity and both symptoms are likely driven by the high prevalence of pain in the population, rather than an interaction with bleeding.

We found three clinical studies that commented on fibroid size and pain during pregnancy.^{4,2,5} All classified disease severity with measures of fibroid volume dichotomized at arbitrary cut-off points. In a study among women with only one fibroid (n=434), Exacoustos and Rosati noted that a fibroid in the uterine fundus or isthmus or those larger than 200cc were associated with pelvic pain during pregnancy (women who had a miscarriage were included in these analyses).⁴ Koike and colleagues' chart review, found no difference in documented, second trimester pelvic pain was found when comparing women whose largest tumors were greater than/less than six cm.⁵ Finally, a retrospective chart review from Duke University Medical Center reported that a quarter of pregnant patients with fibroids five cm or larger (n=39) required narcotic analgesics for their pelvic pain (none did among their age, race, and parity matched control group); this increased prescribing of narcotics was noted in the other two studies as well.^{4,2,5} In these instances, prescribing could be driven by the higher probability of an awareness of fibroids (if fibroids are documented in medical records, they are more likely to be symptomatic/problematic).²

Our study has several limitations. First, reasons for bleeding and pain were not ascertained in RFTS interview questions, so it is also possible that other medical conditions rather than the presence or severity of any fibroids are causally related to these symptoms during pregnancy. The non-specificity of vaginal bleeding and abdominal pain poses limitations in most studies—for example, not being able to differentiate between cramping and gastrointestinal distress. Certain pregnancy outcomes may have an etiologic relationship with bleeding and pain symptoms; we did not exclude women with unknown outcomes or those such as miscarriage, stillbirth, ectopic, or molar pregnancies out of concern about introducing overadjustment bias.¹⁶ Results from secondary analyses excluding these women (n=595) were consistent with adjusted models including the women, though effect estimates differed slightly in magnitude (not shown). Our inclusion of a “missing” category for hypertension preserved sample size in our regression analyses, but due to concern about introducing bias with this method, we ran our unstratified models without the missing hypertension adjustment (not shown).¹⁷ The estimates for the effect of increasing number of fibroids were similar; the estimates for fibroid volume presented in the paper tended to be more conservative, suggesting a modest bias toward the null, than those from models without the missing hypertension adjustment (the latter estimates were expectedly less precise as well). We also acknowledge the possibility that physicians discussed fibroid findings from ultrasounds with their patients. Although we cannot quantify this, it is possible that fibroid counseling was differential by exposure status (women with a greater fibroid burden were more likely to learn about fibroids and commonly associated symptoms). However, these limitations do not change the importance of our finding that women with more numerous fibroids are experiencing (or reporting) more pain than women with fewer fibroids. Regardless of their etiology, these symptoms impact quality of life and healthcare utilization.

Pain and bleeding are common and non-specific symptoms in pregnancy, but uterine fibroids should be considered in a differential diagnosis. Characteristically large and numerous fibroids are believed to be most likely linked to such symptoms, but our data suggest this is an oversimplification. Better understanding of how fibroid number or size impact pregnancy may help in the development of anticipatory guidance or educational

materials for pregnant women with fibroids. Our data indicate that larger tumor volume may not play a significant role in exacerbating first trimester symptoms of bleeding and pain. However, further research is needed to explore the role of fibroid position and type.

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Table 1Maternal characteristics in relation to fibroid status: *Right from the Start*, 2000-2011

Characteristics	No fibroids (n=4,025)		Fibroids (n=484)		<i>P</i>
	n	%	n	%	
Age (y)					<0.001
<26	1306	32.5	78	16.1	
26 and <29	939	23.3	80	16.5	
29 and <32	914	22.7	121	25.0	
32	866	21.5	205	42.4	
Missing	0		0		
Race/Ethnicity					<0.001
Non-Hispanic white	3266	81.2	304	62.8	
Non-Hispanic black	755	18.8	180	37.2	
Missing	4		0		
BMI					<0.001
Underweight	103	2.6	9	1.9	
Normal weight	2196	54.8	211	43.6	
Overweight	927	23.1	128	26.5	
Obese	785	19.6	136	28.1	
Missing	14		0		
Parity					0.645
0	1897	47.6	236	49.3	
1	1391	34.9	157	32.8	
2+	694	17.4	86	18.0	
Missing	43		5		
Diabetes					0.620
No	3914	97.3	469	96.9	
Yes	109	2.7	15	3.1	
Missing	2		0		
Hypertension					<0.001
No	2220	55.2	296	61.2	
Yes	135	3.4	30	6.2	
Missing ^a	1670	41.5	158	32.6	
First trimester smoking					0.004
Non-smokers/quit prior to first trimester/ unknown when quit	3517	87.4	446	92.2	
Current smokers	163	4.1	17	3.5	
Possible first trimester use (quit within 4 months of interview)	344	8.6	21	4.3	
Missing	1		0		
First trimester alcohol use					0.041
Non users/quit prior to first trimester	1731	43.0	227	47.0	

Characteristics	No fibroids (n=4,025)		Fibroids (n=484)		<i>p</i>
	n	%	n	%	
Current users	194	4.8	31	6.4	
Possible first trimester use (quit within 4 months of interview)	2099	52.2	225	46.6	
Missing	1		1		
Household Income					0.075
\$40,000	1135	29.1	115	24.4	
\$40,000-80,000	1509	38.7	187	39.7	
\$80,000	1252	32.1	169	35.9	
Missing	129		13		
Education Level					0.011
High school	653	16.2	54	11.2	
Some college	727	18.1	86	17.8	
4 years college	2644	65.7	344	71.1	
Missing	1		0		
Study Site					<0.001
North Carolina	2270	56.4	312	64.5	
Texas	214	5.3	5	1.0	
Tennessee	1541	38.3	167	34.5	
Missing	0		0		

n=number, y=years, BMI=body mass index, wk=weeks

^aWomen with unknown hypertension status were included as a distinct category in regression analyses. Women missing information for other variables were dropped from pertinent “complete case” analyses.

Fibroid characteristics in relation to first trimester symptoms, among women with fibroids: *Right from the Start*, 2000–2011**Table 2**

Fibroid Characteristics ^a	No Symptoms ^b (n=125)		Only Bleeding (n=37)		Only Pain (n=192)		Both Symptoms (n=130)	
	n	%	n	%	n	%	n	%
Number								
median	1		1		1		1	
[range]		[1, 6]		[1, 7]		[1, 7]		[1, 7]
								0.040
Total volume (cc)								
median	4.7		7.7		4.7		3.6	
[range]		[0.03, 296.6]		[0.25, 421.0]		[<0.0, 377.6]		[0.03, 987.2]
		0.207		0.588		0.387		0.876
Categorical (cc)								0.324
5	63	50.4	17	46.0	102	53.1	72	55.4
>5 and 20	35	28.0	9	24.3	42	21.9	26	20.0
>20	27	21.6	11	29.7	48	25.0	32	24.6

n=number, cc=cubic centimeters

^aThis table is limited to women who had fibroids^bEach group of women reporting symptoms was compared to women without symptoms

Table 3

Associations between number of fibroids^a and symptoms among non-Hispanic white and black women: *Right from the Start*, 2000-2011

Outcome	Unstratified N=4509			White n=3570			Black n=935		
	Unadjusted		Adjusted ^b	Adjusted ^b		Adjusted ^b	Adjusted ^b		Adjusted ^b
	OR	95% CI	OR	95% CI	n	OR	95% CI	n	OR
No symptoms (reference)	-	-	-	-	1066	-	-	303	-
Only Bleeding	1.13	0.92, 1.40	1.07	0.86, 1.34	275	0.91	0.65, 1.28	71	1.17
Only Pain	1.11	0.97, 1.27	1.16	1.00, 1.33	1476	1.10	0.91, 1.33	384	1.14
Both Symptoms	1.34	1.17, 1.54	1.25	1.08, 1.45	753	1.28	1.05, 1.55	177	1.17

n=number, OR=odds ratio, CI=confidence intervals; likelihood ratio test p-value for heterogeneity between races was 0.246

^aThese are results from polytomous regression models (4 models total: unadjusted and not stratified by race, adjusted and not stratified by race, adjusted among white women, adjusted among black women). The “number of fibroids” exposure was a continuous and linear measure.

^bAdjusted for age (quadratic), race, parity, hypertension history, smoking, alcohol use, study site; stratified models not adjusted for race

Table 4

Associations between total fibroid volume and first trimester symptoms^a among non-Hispanic white and black women: *Right from the Start*, 2000-2011

Outcome/Fibroid Volume	Unstratified N=4509				White n=3570				Black n=935			
	Unadjusted		Adjusted ^b		Unadjusted		Adjusted ^b		Unadjusted		Adjusted ^b	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
No Symptoms^c (reference outcome)												
No Fibroids												
5	1.09	0.63, 1.89	0.94	0.53, 1.64	13	1.05	0.56, 2.02	4	0.67	0.21, 2.17		
Only Bleeding												
>5 and 20	1.04	0.49, 2.18	1.06	0.50, 2.27	5	1.05	0.38, 2.87	4	0.95	0.29, 3.19		
>20	1.64	0.81, 3.35	1.48	0.71, 3.10	4	0.91	0.30, 2.78	7	2.00	0.69, 5.79		
No Fibroids												
5	1.21	0.87, 1.67	1.27	0.91, 1.78	71	1.31	0.88, 1.95	31	0.99	0.52, 1.89		
>5 and 20	0.90	0.57, 1.41	0.99	0.62, 1.58	24	0.99	0.53, 1.83	18	0.96	0.45, 2.05		
>20	1.33	0.82, 2.14	1.43	0.87, 2.35	18	0.92	0.46, 1.84	30	1.75	0.82, 3.75		
Both Symptoms												
No Fibroids												
5	1.78	1.25, 2.52	1.42	0.99, 2.05	59	1.79	1.17, 2.72	13	0.58	0.26, 1.30		
>5 and 20	1.16	0.69, 1.94	1.23	0.71, 2.10	19	1.52	0.78, 2.97	7	0.72	0.27, 1.94		
>20	1.85	1.10, 3.10	1.51	0.87, 2.64	13	1.03	0.47, 2.25	19	1.77	0.76, 4.10		

n=number, OR=odds ratio, CI=confidence intervals; likelihood ratio test p-value for heterogeneity between races was 0.228

^aThese are results from polytomous regression models (4 models total: unadjusted and not stratified by race, adjusted and not stratified by race, adjusted among white women, adjusted among black women). Women without fibroids served as the reference group for the categorical "total fibroid volume" exposure.

^bAdjusted for age (quadratic), race, parity, hypertension history, smoking, alcohol use, study site; stratified models not adjusted for race.

^cAmong white women experiencing no symptoms there were 988 without fibroids, 43 with total fibroid volumes of 5; 19 with volumes between >5 and 20; and 16 with volumes >20. Among black women without symptoms, there were 256, 20, 16, and 11 women in each of these exposure categories, respectively.