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Pregnancy, Periods, and "The Pill": Exploring the Reproductive Experiences of Women with Inflammatory Arthritis

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Objective. Women with inflammatory arthritis appear to have fewer children as compared with healthy women, but few studies have assessed how patients' attitudes and decision making influence their family sizes. Little is also known about how patients experience other aspects of their reproductive lives, such as menstruation and contraception.

Methods. We partnered with ArthritisPower, a patient-powered research network, and its associated online patient community, CreakyJoints, to create and disseminate a survey among female members aged 18-50 years with inflammatory arthritis.

Results. Women in the final sample (n = 267) were 40 years old on average; most had rheumatoid arthritis (79%) and were predominantly white and college educated. Many women chose to limit childbearing because of their arthritis (58%); they feared that their arthritis was heritable, their diseases and medications could directly harm a fetus, they would be incapable of physically caring for a child, and arthritis could cause premature death, preventing them from raising their children. Infertility affected 40% of the sample. Half of women experienced subjective arthritis flares around the time of menstruation. Oral contraceptive pills (OCPs) did not worsen disease activity for most women and even prevented menstrual-associated arthritis flares for a subset of women.

Conclusion. Our findings suggest that infertility, but also potentially outsized fear and anxiety related to their diagnoses, may affect the family sizes of women with inflammatory arthritis. The observation that menstruation worsens disease activity for some women requires additional study, and OCP use should be explored as a possible treatment for menstrual-associated arthritis. Clinicians may wish to consider how they communicate patients' individual pregnancy-associated risks, reassure patients when appropriate, and help to guide and support patients to make well-informed reproductive decisions.

INTRODUCTION

Many women with inflammatory arthritis are diagnosed during their childbearing years. A number of studies have found that these women have fewer children as compared with healthy women; postulated reasons for the smaller family sizes have included physical limitations to sexual activity, subfertility from the arthritis or from use of certain medications (eg, methotrexate), or higher rates of fetal loss (1–5). Relatively little is known, however, about how female patients conceptualize pregnancy and child-

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bearing or how their attitudes and beliefs about their diseases may ultimately influence their family sizes. Furthermore, little is understood about these women's other reproductive experiences with respect to their diseases, such as the relationship between menstruation and disease activity or between hormonal contraception and arthritis flares (6–8).

We created a comprehensive reproductive health survey of women with inflammatory arthritis in partnership with the ArthritisPower research network and its partner online community CreakyJoints. This project grew out of interest from Patient Governors of ArthritisPower, who felt that certain reproductive health questions of interest to patients are either understudied or unknown. Of particular interest to the Patient Governors was a general concern that oral contraceptive pills (OCPs) worsen inflammatory arthritis, a fear fueled by online patient chatter and personal stories.

Our objective was to explore these topics and expand our understanding of factors that either facilitate or act as barriers toward women's abilities to achieve the family size that they desire. Furthermore, we investigated how women with inflammatory arthritis navigate family planning decisions and explored their broader experiences with infertility, contraception, and menstruation.

PATIENTS AND METHODS

The Institutional Review Board of Duke University approved this study (PRO00079454).

Patient involvement in survey development. The cross-sectional, online survey used in this study was developed in concert with two patient-focused organizations: 1) ArthritisPower, a patient registry sponsored by the Patient Centered Outcomes Research Institute, and 2) CreakyJoints, which includes a large online community of individuals living with rheumatoid arthritis (RA), juvenile inflammatory arthritis, psoriatic arthritis, ankylosing spondylitis, reactive arthritis, inflammatory bowel disease (IBD)-related arthritis, lupus-related arthritis, and other forms of inflammatory arthritis.

The ArthritisPower Patient Governor Group (n = 11) solicited the research team's assistance in developing the survey to answer reproductive health questions of highest priority to patients. Patient collaborators offered feedback about the topics reviewed in the survey, modified survey questions to ensure that they met the information needs of the target population, reviewed the data analysis, and informed the interpretation of results.

The final survey consisted of 183 questions primarily formatted as multiple-choice responses but which also included several optional short-answer responses. The questions assessed patients' experiences with pregnancy, miscarriage, or infertility; historical medication use before and during pregnancy; contraception; menstruation; engagement with primary care providers and subspecialists; preferred resources for reproductive health information; and myths and perceptions related to inflammatory arthritis and pregnancy, childbearing, and disease-modifying antirheumatic drug (DMARD) use.

Recruitment and data collection. Inclusion criteria for the survey included patients 18-50 years old who were registered as members of ArthritisPower or CreakyJoints. Patients were otherwise excluded if they had a sole diagnosis of osteoarthritis (without concomitant inflammatory arthritis) or were unable to complete the survey in English. Given the focus of this manuscript, only responses from female respondents are reported.

Recruitment occurred between March and June 2017. Patients registered with ArthritisPower and CreakyJoints were solicited via email to participate in the study. The survey software automatically excluded individuals who did not meet age criteria. Study coordinators assessed the disease diagnoses to ensure patients met eligibility criteria. An electronic patient consent form was available on the software platform, which patients were required to complete before accessing the survey questions.

The following information was obtained from patients for this analysis.

Demographics. Women were queried about their current age, age at diagnosis, races/ethnicity, and educational attainment.

Family size. Women were asked if their inflammatory arthritis affected their desired family size. We assessed whether patients' responses were associated with demographic factors or use of certain DMARDs, some of which have established fetotoxicity (eg, methotrexate) (9,10).

History of infertility. Participants were asked two questions to capture whether they were infertile: 1) if they had ever been unable to get pregnant after 12 months of trying and 2) if they had ever been diagnosed with infertility by a physician; if they responded positively to either question, they were categorized as infertile. We also explored whether the risk of infertility varied by clinical or demographic characteristics. Participants were asked to share the causes of their infertility and whether they had ever used any physician-assisted reproductive technology (ART) to conceive a pregnancy. Participants who reported male-only factors as the cause of their infertility were excluded (n = 5) as these fertility issues would not be attributable to the patient.

Effects of menstrual cycle and oral contraception on arthritis. Participants were asked if they had ever noticed that their menstrual cycle affected their arthritis activity; to those who responded "yes," we queried about what phases in their menstrual cycles were associated with the least or the most disease activity. An optional open-ended question was also provided so participants could share their experiences with menstruation and disease activity.

To investigate the association between OCPs and arthritis activity, we asked women if they currently or had ever used OCPs, and if so, whether the OCPs affected their disease activity. An optional open-ended question was also included so participants could share more details about how OCPs did or did not affect their disease activity. Participants were not asked to identify the brand or type of OCP that they used (eg, combination estrogen-progestin versus progestin only, monophasic versus multiphasic).Statistical analysis. Responses were analyzed with descriptive statistics as means for continuous variables and frequencies for categorical variables. Differences in means were estimated by *t* tests or ANOVA, depending on the number of categories, and differences in proportions were estimated by Fisher's exact test. All analyses were conducted in SAS 9.4 (SAS Institute).

RESULTS

Patient characteristics. Of the 15332 recruitment emails sent, 416 patients (2.7%) expressed interest in participating in the study, and 267 women met eligibility criteria, were consented, and completed the survey. Table 1 describes the sociodemographic characteristics of these 267 women. Participants were an average of 39.6 years old (SD = 7.1 years) at the time of survey completion, and had been an average of 27.2 years old (SD = 12.3 years) at the time of their arthritis diagnosis. Most women identified as white (84%), and 9% of women reported Hispanic ethnicity in addition to white, black, multiracial, or "other" race. Over two-thirds of women had attained at least a college degree (69%). Twenty-seven percent of women (n = 71) had pregnancies after their disease diagnosis, with a range of 1-5 pregnancies postdiagnosis.

Table 1. Sociodemographic and pregnancy characteristics of cohort (n = 267)

Characteristics	Mean (SD) or N (%)
Age	39.6 (7.1)
Age at diagnosis	27.2 (12.3)
Race[a]	
White	213 (84%)
Multi-racial	18 (7%)
Black	8 (3%)
Other	16 (6%)
Educational attainment	
College or higher	175 (66%)
Less than college	92 (34%)
Number of women who had at least one pregnancy after arthritis diagnosis	71 (27%)
Infertility	106 (40%)

[a] Missing race data (n = 12).

Table 2. Effects of inflammatory arthritis on patients' family planning decisions

Response: Yes, inflammatory arthritis affected the number of children the patient wanted to have (n = 149, 58%)	
Concerns	N (%)
Would be unable to care for child	126 (85%)
Antirheumatic drugs would harm a baby	91 (61%)
Child might inherit arthritis	77 (52%)
Arthritis might cause premature death of the patient so that she could not raise her child(ren)	51 (34%)
Arthritis might directly harm a developing baby	47 (32%)
Physician counseled against pregnancy	24 (16%)
Infertility	18 (12%)
Pregnancy loss	15 (10%)
Fear of arthritis flare during or after pregnancy	13 (9%)
History of pregnancy complications	2 (1%)
Response: No, inflammatory arthritis did not affect the number of children the patient wanted to have (n = 96, 37%)	
Concerns	N (%)
Had children before arthritis diagnosis	49 (51)
Arthritis does not affect pregnancy decision making	31 (32)
Never wanted children	9 (9)
Plan to adopt or have adopted	8 (8)
Response: Not sure, patient has not yet thought about having children (n = 12, 5%)	

The most common of the inflammatory arthritides in the sample included RA (79%), followed by juvenile idiopathic arthritis (JIA) (14%), psoriatic arthritis (11%), ankylosing spondylitis (9%), and IBD-associated arthritis (6.4%). Nearly all women had used at least one conventional or biologic DMARD prescribed for inflammatory arthritis (93%).

Family Size. We inquired whether women's diagnoses of inflammatory arthritis had influenced their plans for childbearing (Table 2). A majority of women wanted fewer children because of their arthritis (58%); the most commonly cited reason was concern that they would be unable to adequately care for a child (85%). Many women also expressed concerns that their arthritis medications might harm a child (61%) or that their diseases might be inherited by their children (52%). Approximately one-third of women (34%) feared that they would die prematurely because of their arthritis and would not live long enough to raise their children. A similar number of women (32%) feared that their arthritis could

directly harm a developing fetus. In contrast, a minority of women in the cohort reported that their arthritis diagnosis had not changed their plans for childbearing (37%), although half of these women had borne all of their children prior to their arthritis diagnoses (51%).

Women who wanted fewer children because of their arthritis differed from other women in the sample: they were diagnosed with their arthritis at a younger age, had used more medications since the time of diagnosis, and were younger at the time that they completed the ArthritisPower survey ($P < 0.05$).

Current or historical use of certain antirheumatic drugs may have also influenced some women's family size preferences. For example, women who had ever used methotrexate or leflunomide were more likely to report that they wanted fewer children because of arthritis as compared with nonusers ($P = 0.01$). These women also trended toward a greater likelihood of reporting that a physician had advised them against childbearing (18% vs 0%) and were more likely to express concerns about the effects of their medications on a developing fetus (64% vs 41%), although these comparisons did not reach statistical significance.

In comparison, current or historical use of tumor necrosis factor (TNF)-alpha inhibitors did not affect women's desires to have more children as compared with other women ($P = 0.2$). However, users of these medications trended toward a greater likelihood of reporting that a physician had told them not to have (more) children (23% vs 12% of nonusers) or were more likely to express concerns about the effects of their medications on a developing fetus (71% vs 55% of nonusers). TNF-alpha inhibitors are currently considered to be compatible with pregnancy (10–12).

Infertility. Over one-third of women in our cohort reported that they were infertile (40%). These women did not differ from the remainder of the sample with regards to current age, age at diagnosis, ethnicity/race, or educational attainment ($P > 0.05$). Women with IBD trended toward greater rates of self-reported infertility than did women without IBD (73% of IBD patients compared with 38% of participants in the general sample); otherwise, women with infertility did not vary from the remainder of the sample with regards to arthritis subtype or use of current/historical use of drugs that have been associated with subfertility or miscarriage (ie, nonsteroidal anti-inflammatory drugs [NSAIDs] and methotrexate).

Among women with infertility, 60% reported that either a physician had confirmed the infertility or that they had used an ART; we categorized these women as having "confirmed" infertility. The remaining 40% of women indicated an inability to become pregnant within 12 months of attempting to conceive but did not report a physician diagnosis of infertility or use of ART; we categorized these women as having "unconfirmed" infertility. Women with confirmed versus unconfirmed infertility did not differ with regards to race or ethnicity, educational attainment, disease diagnosis, or current/historical use of any specific antirheumatic drugs.

The most common causes of confirmed infertility included abnormality of the ovaries, ovulation, or premature menopause (51%), whereas half of unconfirmed infertility cases were attributed to unknown causes. Approximately equal numbers of women with confirmed or unconfirmed infertility reported prior histories of endometriosis (approximately 25%); uterine, cervical, or fallopian tube abnormalities; or pelvic inflammatory disease (approximately 25%).

ART was used by 84% of women with confirmed infertility. The most common ART methods include oral medications (68%), hormonal injections (37%), and artificial insemination (32%), whereas in vitro fertilization or surgery were less commonly used (20% or less).

Associations of menstrual cycle with disease activity. Approximately half of respondents felt that their arthritis disease activity varied over the course of their menstrual cycle (49%). As one patient with JIA described, "My arthritis pain gets much, much worse around menstruation, especially in my knees and hands." Other respondents described pain in their sacroiliac joints and hips. In comparison, 32% of women did not experience changes in their disease activity during their menstrual cycles, and 19% were unsure if menstruation affected their arthritis.

Among respondents whose arthritis symptoms worsened during their menstrual cycles nearly, all women experienced the worst disease activity several days prior to or during menstruation (96%). One patient with RA expressed a common observation, "I noticed that I was having a flare every month [during] the week leading to my period." In contrast, disease activity improved several days after and up to two weeks postmenstruation for nearly all of these women (92%).

Associations of OCPs with disease activity. OCPs were the most common contraceptive method currently or ever used by women in the sample (52.3%). Most women did not notice that OCPs affected their disease activity (70%) and 12% were unsure of the effects of OCPs on their arthritis. However, OCP use appeared to improve arthritis symptoms for 8.8% of women. As one patient with IBD noted: "I'm not sure that the relationship is causal, but I have much less pain in my hips, which were the joints that kept me up the most at night." In contrast, OCPs worsened symptoms for 10.2% of respondents. According to a patient with RA: "My joints were sore and I was fatigued horribly while on birth control pills."

Additional free-text responses from patients regarding the associations between their disease activity and OCP use are presented in Table 3.

Use of OCPs to manage menstruation-related arthritis. Patients were not explicitly asked how they treated menstrual-associated disease flares, but five women reported

Table 3. Representative Patient Quotes about the Effects of Oral Contraceptive Pills (OCPs) on Menstruation and Subjective Disease Activity

Menstrual-Associated Arthritis improved with OCPs	*Patient Diagnosis*
"I am on [OCP], which allows me to only have my period every 90 days, the reduction in inflammation has been noticeable."	AS
"I believe that hormone surges in a normal cycle can drive inflammation and pain in sacroiliac joints and so birth control somewhat curbs this (however, I continued to get flares while on birth control and so it did not make a huge difference)."	AS
"I had my [intrauterine device] taken out 2/2/17 and started [OCP] shortly before. I have noticed a decrease in flares and in disease activity."	RA
"I flared every period and being on the pill prevented that from happening."	SLE
"My arthritis pain gets much, much worse around menstruation, especially in my knees and hands. I take my [birth control] continuously because it halts (for the most part) my periods and removes this additional uptake in my symptoms."	JIA
"[I've experienced] less inflammation with menses and less inflammation in my affected joints."	RA
"On certain birth control triphasic pills, I had more pain during one week of the month. I switched to low-dose monophasic pills and that helped."	SLE
"When I take the pill straight through and skip the sugar pill week so that I miss my period, I don't have the premenstrual mini flares that I'm prone to."	AS
"I noticed that I was having a flare every month for the week leading to my period. My physician directed me to take 10 mg prednisone each day that week. Eventually I asked to be put on birth control pills."	RA
Menstrual-Associated Arthritis worsened with OCPs	*Patient Diagnosis*
"I had a lot more flares and had to stop taking birth control pills due to migraines with aura and high cholesterol."	RA
"I had joint swelling and weight gain."	JIA
"I had multiple flares while on birth control."	RA
"The [oral contraceptive] pill caused swelling in my joints."	RA
"When I was younger, I was put on Depo Provera by my former rheumatologist and it caused a constant flare- very bad. In my recent attempts at IVF, I have used birth control pills (in addition to the other IVF meds) and experienced marked disease activity."	RA
"[OCPs] made my periods lighter, made my joints worse, my lupus flared all the time."	SLE

Table legend: Quotations were selected for clarity and relevance. Abbreviations: AS: ankylosing spondylitis; JIA: juvenile idiopathic arthritis; RA: rheumatoid arthritis; SLE: systemic lupus erythematosus

in free-text responses that they used OCPs for the purpose of preventing menstrual-associated flares. As one patient with RA described, "I found that being on a steady low estrogen pill and skipping the sugar pills has helped avoid monthly flares that were tied to menstruation. I still take a daily birth control pill for this purpose even though I have permanent birth control in place."

A similar management strategy was described by another RA patient, "I noticed that I tended to have flares shortly before my period, so I went on a birth control pill I could take continuously to suppress my period, which has helped avoid the menstrual cycle related flares."

DISCUSSION

Our study evaluated personal and health-related factors that affected a variety of reproductive experiences among women with inflammatory arthritis. Nearly 60% of women avoided pregnancy because of fears and anxieties related to their arthritis. Infertility affected 40% of respondents, many of whom used ART to try to conceive. Half of women experienced arthritis flares immediately prior to or during menstruation, and some women successfully used hormonal contraception to ameliorate the effects of menstruation-associated arthritis flares. OCPs were generally well tolerated and improved subjective disease activity in a small subset of women.

Smaller family sizes have been observed among women with inflammatory arthritis, which may also reflect clinical factors, such as physical disability, subfertility that is due to highly active disease or use of certain drugs, and/or higher rates of miscarriage (1–5). However, this patient-driven reproductive health survey underscores the importance of women's decision-making as a determinant of family size, as 58% of women chose to limit childbearing because of their arthritis. Most women were concerned about their ability to care for a child and/or the direct effects of medications and arthritis on

a developing fetus. Many women also feared that they would die early from arthritis and be unable to raise their children. Our findings are consistent with prior studies in which women with inflammatory arthritis expressed considerable anxieties about motherhood and parenting (13–15).

This study reveals an important disconnect between how childbearing risks are perceived by patients and by their physicians; patients may perceive disease-related risks as absolute contraindications toward childbearing, whereas physicians may not find such risks to be insurmountable. Women who expressed fears about childbearing in our cohort appeared to have more severe disease than other women; they were younger at the age of diagnosis and had used more biologic DMARDs. However, only 16% of these women reported that a physician had ever advised them to avoid childbearing. Indeed, most existing studies suggest that women with inflammatory arthritis can have healthy pregnancies and children, particularly if their arthritis is well controlled at the time of conception (16–18). Furthermore, inflammatory arthritis is rarely associated with increased mortality during the childbearing years (19). Future studies should explore how to enhance delivery of evidence-based information to women to better inform their reproductive decisions.

Infertility may have been another important predictor of family size in this group of women, as 40% of respondents reported that they were infertile. When only considering "confirmed" cases, 24% of the women in this study had infertility. This is generally consistent with estimates of infertility in other studies of women with inflammatory arthritis (2,20–23), which range from 25% among women with RA in the US National Data Bank for Rheumatic Diseases (NDB) cohort (20) to 42% in the Pregnancy-induced Amelioration of Rheumatoid Arthritis (PARA) cohort (3). Women with IBD may also have marginally lower rates of fertility, particularly when their diseases are active (21). In comparison, only 12.1% of women aged 15 to 44 years old report impaired fertility in general US population estimates (22).

In our cohort, the most common causes of confirmed infertility included either ovarian or ovulation problems or premature menopause. Reasons for infertility among women with RA in the NDB cohort including ovulatory dysfunction (19%) and endometriosis (10%) (20), whereas 28% of women in the PARA cohort reported ovulatory dysfunction (23). Medications may also increase risk of subfertility among patients with inflammatory arthritis; NSAIDs or prednisone at doses higher than 7.5 mg daily increased time to pregnancy, even with adjustment for disease activity (3). At this time, there is no clear association between reduced ovarian reserve, as measured through anti-Mullerian hormone levels, and infertility in RA patients, although ovarian reserve may be lower among some women with IBD and JIA (24,25).

Menstruation affected arthritis activity for nearly half of the respondents, particularly in the luteal phase, as disease activity worsened for most women several days prior to or during menstruation. Consistent with our findings, one study of 14 women with RA reported that 50% of postovulatory women had clinical improvement in their RA, whereas the preovulatory phase was associated with increased morning stiffness; another study found that grip strength significantly decreased among seven RA patients at the beginning of menstruation; and a more recent study of women with RA and systemic lupus erythematosus (SLE) found that 36% of SLE patients and 28% of RA patients experienced self-reported flares immediately prior to menstruation (26–28). In contrast to our findings, one study found that among 20 women with RA, pain severity was stable throughout the menstrual cycle (29).

Immunologic causes of disease flares immediately prior to menstruation remain speculative. Estrogen and progesterone appear to have anti-inflammatory properties that might ameliorate joint inflammation (30). Alternatively, regulatory T cells, which appear to maintain immunologic self-tolerance, appear to dramatically decrease in the luteal phase of menstruation, which seems to coincide with the increase in disease activity experienced by some women with inflammatory arthritis (31). To clarify the relationship and potential mechanisms between the menstrual cycle and arthritis activity, future work could examine menstrual cycle phases, inflammatory markers, pro-inflammatory cytokines and regulatory T cell levels, sex hormone levels, and patient-reported flares, in relation to objective measures of disease activity, such as swollen joint counts. Clinical trialists may also wish to explore the phenomenon of menstrual-associated flares, as its effects on patients' global assessment scores could possibly influence trial results and interpretation.

The ArthritisPower Patient Governors colloquially suggested that many women with arthritis avoid OCPs because they had heard—usually through blogs or other unverified resources—that OCPs worsen inflammatory arthritis. However, data from several clinical studies suggest that OCPs may ameliorate disease activity for some, although not all, women with RA (6–8). In our cohort, we also observed that 10% of women's disease activity improved with OCPs, and the great majority of women experienced no deleterious effects on their arthritis. Therefore, OCPs appear to be well tolerated by many women with inflammatory arthritis. Although OCPs may not reduce disease activity for all women, future randomized studies should be conducted to assess whether OCPs improve symptoms among patients who have inflammatory and/or menstrual-associated arthritis flares.

Our study has several strengths. Although many reproductive surveys have engaged older women who are asked to recall prior experiences, respondents in this study generally included patients of reproductive age when they completed the survey and thus were more likely to accurately report their experiences. Although women self-reported inflammatory arthritis and we could not independently confirm their

diagnoses, the fact that 93% reported having taken at least one DMARD supports the validity of diagnoses in our sample. Finally, the questions and topics covered in this survey directly reflect the interests and concerns expressed by young, female patients; thus, patients in this demographic may find the results described herein as being particularly relevant to their experiences and lives.

Our study does have important limitations. First, our sample was generally white, highly educated, and had Internet access; therefore, our results may be more representative of the experiences of women with higher socioeconomic status than of the general US population. The high prevalence of self-reported infertility in our sample must be interpreted with caution; women who have struggled with infertility may be more likely to respond to a reproductive health survey than other women. Our sample may be further biased toward women who are interested in completing a lengthy and personal reproductive health survey, which suggests that they may have had more struggles than other women. Another limitation of our study is that we did not gather information about the timing of infertility relative to women's inflammatory arthritis diagnoses; there is limited evidence that subfertility and premature menopause may precede the development of clinical RA, although this work has not been replicated in a contemporary sample (32). Alternatively, active rheumatic diseases or use of certain drugs may have contributed to the high rates of infertility in the sample (3).

To summarize, this study found that patients' outsized fears about inflammatory arthritis and prognosis factor into their reproductive decisions. Clinicians may wish to carefully consider how they communicate patients' individual disease- or medication-associated risks and reassure the patient when appropriate, guiding patients toward well-informed, values-concordant reproductive health decisions. Infertility may prevent many women from achieving their intended family size, and ART was used by a majority of women with inflammatory arthritis and infertility. Future work should confirm whether menstrual phases are associated with objective measures of arthritis disease activity, or whether OCPs can be used as treatment for menstrual-associated arthritis. Women with inflammatory arthritis need more counseling about their specific pregnancy-associated risks, fertility, and contraception to help them to make well-informed decisions and safely achieve the family sizes that they truly desire.

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AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Drs. Birru Talabi, Eudy, and Clowse had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study conception and design. Clowse, Eudy, Nowell, Curtis, Crow-Hercher, Whitney White, Ginsberg.

Acquisition of data. Jayasundara, Haroun, Eudy, Clowse.

Analysis and interpretation of data. Birru Talabi, Eudy, Jayasundara, Haroun, Nowell, Curtis, Crow-Hercher, Whitney White, Ginsberg, Clowse.

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