A Cross-Sectional Survey of Fertility Knowledge in Obstetrics and Gynecology Residents

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Abstract

PURPOSE: To evaluate fertility knowledge among current Obstetrics and Gynecology (OB-GYN) residents using a recently published validated instrument, the Fertility and Infertility Treatment Knowledge Score (FIT-KS).

METHODS: OB-GYN residents in the United States were recruited through an email to all residency directors nationwide. They were asked to voluntarily respond to a short questionnaire including demographic information and the FIT-KS instrument, through an online survey platform. Of approximately 5,000 OB-GYN residents in the country, 177 responded.

RESULTS: The sample was 91% female, with 69% between the ages of 26 and 30. Participants evenly represented all four years of training. Mean FIT-KS score was 21.2 (73% correct; range 17-26). No statistically significant differences were noted across the level of training (p=0.23). Several knowledge gaps were noted. Residents could define the common assisted reproductive technologies; however, overestimated their success rates per cycle.

CONCLUSIONS: Substantial gaps exist in fertility knowledge among OB-GYN residents, with understanding of male fertility and success rates of Assisted Reproductive Technologies (ART) being particularly limited. Knowledge of fertility does not change throughout residency training, demonstrating consistent gaps in fertility knowledge. Knowledge during post graduate year (PGY)-1 year is consistent with mean scores found in prior research in Internal Medicine residents (65%), as well as a cohort of female medical students and obstetrics and gynecology residents and fellows (64.9%)(1, 2).

Introduction

Age related fertility decline has been highlighted in recent years in the popular media, however misconceptions still exist among the general public. Approximately 48.5 million couples worldwide experience infertility, but the majority of the population does not understand natural fertility and age-related fertility decline (3). Prior research has demonstrated consistently low rates of fertility knowledge in international populations, in reproductive-aged women, and across educational spectra (4-6).

In the general population, criteria for infertility diagnosis are met by approximately 12.5% of women (7). Women with higher educational attainment and occupational status were more likely to have experienced infertility (7). We know that there is a delay in childbearing among female physicians, especially for surgeons (8). On average, female physicians were found to have their first child 7.4 years later than the general population (8). Thoracic surgeons wait even longer, at 9 years later (9). A later start to family-building has been shown to decrease family size (10, 11). Postponing parenthood and attempts at pregnancy are also associated with a higher rate of adverse pregnancy outcomes (11). Women with higher education are also known to be more likely to underachieve their fertility intentions than those who do not pursue higher education (9, 12-14).
In one recent study, 24% of female physicians who tried to conceive were formally diagnosed with infertility, of whom 21.7% were ultimately unable to conceive (8). A substantial portion (43.1%) of those diagnosed with infertility were “quite a bit” to “very much” surprised at their diagnosis (8). Female urologists with successful births utilized assisted reproductive technologies (ART) at almost ten times (OR 9.77; 95% CI 5.91 to 16.16) the rate of the general population (15). Thoracic surgeons have also been shown to utilize ART at a higher rate than the general population (9).

If, as this data suggests, female physicians have knowledge gaps about their own fertility, it also stands to reason that they may be unable to adequately counsel their patients on this topic. Additionally, in studies of physicians’ awareness of infertility risk and treatment recommendations, male physicians were less likely to identify at risk individuals and less likely to provide components of the medical standard of care for an infertility evaluation than did female physicians (16). As such, this study aims to evaluate whether both male and female obstetrics and gynecology residents are appropriately knowledgeable about natural fertility and age-related fertility decline.

**Materials And Methods**

Permission was received to use the Fertility and Infertility Treatment Knowledge Score (FIT-KS). The FIT-KS is a web-based survey, with 29 multiple-choice items. It assesses knowledge of natural fertility (21 questions) as well as infertility treatment (8 questions). It has previously been validated in both reproductive-aged women in the US as well as in female medical trainees (1). The correct answers were based on the latest Society for Assisted Reproductive Technology (SART) data from the year of creation of the survey (2014).

Institutional review board deemed the study exempt through Temple University College of Medicine (#25003). All participants gave written informed consent through the survey, and risk was deemed to be minimal.

In April of 2018, the research team emailed all Obstetrics and Gynecology residency directors (N=255) with the request to forward the web-based survey to their residents through email. Two follow-up reminder emails were sent over April and May 2018. The survey was hosted by Survey Monkey, and at the end of the survey respondents were able to click on a separate url not linked to their original survey to be entered into a lottery for 1 of 4 $25 Amazon gift certificates. Our response rate calculation is imprecise as the exact number of residents who received the recruitment email from their residency directors is unknown, however in number of responses it was consistent with other surveys performed of this population. Of approximately 5,000 active OB-GYN residents in the country, 177 responded (4% response rate).

Statistical analysis was performed using either an Analysis of Variance (ANOVA) or two sample t tests as appropriate for the data set. Bartlett’s test was used to verify that variances were equal across the samples in cases where ANOVA was used. All statistical analysis was performed in Stata 14.0 (StataCorp
LP, College Station, TX). Of the residents who opened the survey, eleven failed to complete all questions and were discarded from the analysis.

The FIT-KS score was calculated by dividing the number of questions answered correctly by the total number of questions – twenty nine. The higher the score, the more answers were correct.

Results

Demographics and fertility knowledge (Table One)

Of approximately 5000 OB-GYN residents in 255 programs in the United States, there were 177 residents who responded to the survey. Of these, 166 completed all questions in the survey. The other 11 residents opened the study, but did not complete all questions. The demographics of those who opened but did not complete all questions were consistent with the other responses from the survey per analysis by our statistician, and they were excluded from the final analysis. We do not know what proportion of respondents came from which residency programs.

Ninety-one percent of respondents were female. Sixty-nine percent were between the ages of 26-30. They represented an equal distribution between all four levels of training, with 40, 47, 39 and 40 representing each year of study (n=166).

The difference in mean score of each year of study was not statistically significant (p= 0.23). In total, the highest score available was 29. Post-graduate year (PGY)-1 residents received a mean score of 20.73 (71%; range 17-25), PGY-2 a mean score of 21.64 (75%; range 19-25), PGY-3 a mean score of 20.95 (72%; range 18-24), and PGY-4 a mean score of 21.23 (73%; range 17-26). Gender was also not a statistically significant predictor of score (p=0.30): females’ average score was 21.20 (73%; range 17-26) and males’ average scores was 20.57 (71%; range 18-24). Age category also failed to predict score in a statistically significant manner (p=0.79), with 26-30 scoring 21.08 (73%; range 17-25), 31-35 scoring 21.32 (74%; range 18-25), and 36-40 scoring 21.50 (74%; range 21-22).

Thirty-three percent stated they were not concerned about their own future fertility, and level of concern did not predict average FIT-KS score; those unconcerned about future fertility had a mean score of 21.36 (74; range 17-26%), while those with concerns scored an average of 21.15 (73%; range 17-26), which was not statistically significant (p=0.57).

The majority of residents (158, 95%) stated that they had ever discussed fertility with their patients. Mean score of those who did discuss fertility was 21.21 (73%; range 17-26), compared to 21.60 (75%; range 20-26) for those who did not, which was not statistically significant at p=0.69. One hundred and thirty-three (82%) stated that they felt comfortable discussing fertility with their patients, with a mean score of 21.29(73%; range 17-26), compared to 20.9 (72%; range 17-24) for those who did not feel comfortable discussing fertility with their patients, which was not statistically significant at p=0.41. Seventeen
respondents currently have children, with a mean score of 21.59 (74%; range 18-25), not statistically significantly higher than those who did not at 21.18 (73%; range 17-26) (p=0.45).

Gaps in Knowledge

Significant gaps in knowledge were noted (Table 2 and 3). Many answered incorrectly regarding fecundity, age of precipitous fertility decline, and *In Vitro* Fertilization (IVF) success rates. Fifty-nine percent incorrectly identified pregnancy rate per cycle for a woman under thirty-five years old undergoing *in vitro* fertilization. Forty-three percent did not know the average survival time of normal sperm in the female reproductive tract. Only 73% knew that the male partner's age affected fertility, 48% knew that moderate alcohol consumption did not affect fertility, and 70% knew that using certain types of sexual lubricants affects fertility.

Discussion

Substantial gaps exist in fertility knowledge among OB-GYN residents. Although not all obstetrics and gynecology residents will desire to have children, those who do may not be adequately prepared to make informed decisions about their future childbearing plans. Of course, there are many other factors that encourage physicians to delay pregnancy including but not limited to career plans, availability of childcare, and financial burden of children during residency. If this lack of fertility knowledge encourages physicians to delay pregnancy (for instance beyond the completion of training) they may be inadvertently reducing their chances at childbearing due to natural decline in fertility. They also may not be prepared to properly counsel patients and have family planning discussions during routine visits. Our findings should be viewed by residency program directors as a starting place to encourage more exploration of this gap in knowledge in their own programs.

Knowledge of fertility does not change throughout residency training, with this study demonstrating consistent gaps in fertility knowledge. Knowledge during residency is only slightly higher than mean scores found in prior research in Internal Medicine residents (65%), as well as a cohort of female medical students and obstetrics and gynecology residents and fellows (64.9%)(1, 2). In prior studies, the median score for reproductive-aged women was 16/29 (55.2%) and in medical trainees the median score was 19/29 (65.5%)(1). Lack of time dedicated to education on this topic during both medical school and residency may be contributing to the patterns seen in physicians’ childbearing choices. This may also cause insufficient counseling and engagement of patients on family planning choices. Less than a quarter of reproductive-aged women have had discussions regarding reproductive health with their health care providers(4). Although it is encouraging that the majority of residents stated that they discuss fertility with their patients, and the majority feel comfortable having this discussion, it remains concerning that several key areas of misinformation were identified, particularly regarding the overestimation of ART success rates.

One area that the survey may not be reflective of current practice is twinning rate. Correct answer in the FIT-KS survey was coded as 21-35% twinning rate, but most recent SART data is closer to 12%, making
the majority of resident respondents correct according to the most recent data.

As women choose to delay childbearing, they will increasingly rely on ART, and should be sufficiently counseled on success rates that also decrease with aging (6). In this study, there was a large overestimation of success of IVF after the age of 44. The misconception that ART can be used successfully with a couple’s own genetic material to compensate for the natural decline of fertility with aging should be counteracted by consistent discussion well before women reach the natural limits of their reproductive capacities (17). In order for gynecologists to lead these conversations with their patients, they must receive adequate training on fertility counseling during training.

This study has a number of strengths, including using a newly validated survey, the FIT-KS, which was developed for use in physician populations. Until its creation, there has not been an instrument validated in the United States for measuring fertility knowledge. We included all analysis of the data, including several that upheld the null hypothesis. In this way, we avoided negative reporting bias. To avoid selection bias, we sent the FIT-KS survey instrument to all OB-GYN residency directors in the country (N=255).

Limitations of this study include the response rate. Our response rate calculation is imprecise as the exact number of residents who received the recruitment email from their residency directors is unknown. If all residents did have access to the survey, the response rate would be approximately 4%, a magnitude consistent with other published survey research of obstetrics and gynecology residents through email recruitment - at 2.2% and 5% respectively(18, 19). It is impossible to ensure that the survey was received by all of the intended recipients. Although we attempted to avoid selection bias by recruiting through email, some bias may be in this data set by the self-selection of participants as those who are willing to spend the time to answer a survey may have different practices then those who do not, which was not measured. It is an interesting thought experiment to consider whether these responses were representative of the population sampled - certainly those who were more likely to answer could possibly be assumed to also have more interest in and motivation for learning about reproductive endocrinology and infertility. This would make the data overestimate the true knowledge in this population, as residents with an interest in reproductive endocrinology and infertility would likely have a higher knowledge base than those who have other interests. This, therefore, would make the situation even more dire than it even appears in this sample. We also do not know if a single or several residency programs were overrepresented in the sample as we do not know which programs had multiple residents respond. We also do not know if the respondents had completed their REI rotation prior to participating in the study.

There was also a small over-representation of women in the sample, as approximately 85% of residents in Obstetrics and Gynecology are female compared to 91% in our sample (20). This also lends itself to the question of why female recipients were more likely to respond, for instance is this a topic they are more exposed to outside of their career in addition to their education.

Going forward, additional research should be performed both on obstetrics and gynecology residents and other medical specialties to further elucidate knowledge of age-related fertility decline, as our limited residency response rate limits the generalizability of this data. Additionally, the answers were not
updated to reflect the latest SART data regarding infertility technology rates of success, which should be
done for future uses of this survey. Data could also be collected regarding training program location,
IVF/fertility program in house, fellowship program attached to residency, when Reproductive
Endocrinology and Infertility (REI) rotations occur, and total time on REI rotation. All OB-GYN residents
throughout the country are required to do some form of REI rotation, and this information should be
correlated with score to see its effects on knowledge both short and long-term. Additional information
should be gathered about the different REI curriculums at residency programs as they vary greatly
throughout the country.

Moreover, interventions, such as an online didactics curriculum on natural fertility and age-related fertility
decline should be developed for use in residency programs and as continuing medical education to
increase knowledge in this area. Data should be collected from these endeavors such as CREOG scores
prior to intervention, a pre-test, a post-test several months after intervention to gauge retention of the
subject matter, and the next year's CREOG score.

**Conclusion**

Knowledge of age-related fertility decline among obstetrics and gynecology residents is limited.
Misconceptions about natural fertility, risk factors, and success of treatments may significantly affect the
lives of both physicians and the patients they treat. The FIT-KS instrument is a valuable tool that should
be continued to be used in the future in both physician and general populations, however going forward,
alternative recruitment methods will assist in generating more useful data for analysis.

**Declarations**

Funding: The authors report no external funding source for this study.

Competing Interest: The authors declare that there are no conflicts of interest regarding the publication of
this paper.

Ethics Approval: Institutional review board deemed the study exempt through Temple University College
of Medicine (#25003). All participants gave written informed consent through the survey, and risk was
deemed to be minimal.

Consent to participate: Informed consent was obtained from all individual participants included in the
study

Consent for publication: Informed consent was obtained from all individual participants included in the
study

Availability of data and materials: The data that support the findings of this study are available from the
corresponding author, LMR upon reasonable request.
Presented as an oral presentation at the American Society for Reproductive Medicine Scientific Congress and Expo on October 16, 2019

Code availability: N/A

Authors Contributions: All authors have participated substantially in the work and have met the criteria for authorship. LMR designed the study, collected the data, and prepared the manuscript. RK assisted in study design and editing of manuscript. HZ assisted in analysis of the data. SD assisted in significant editing of the manuscript. MR assisted in study design, IRB preparation, and editing of manuscript. This manuscript is not been published elsewhere, accepted for publication elsewhere, or under editorial review for publication elsewhere.

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Tables

Table One: Demographics and FIT-KS Score
| Demographics | Number | Mean FIT-KS Score         |
|--------------|--------|---------------------------|
| PGY1         | 40     | 20.73 (71%; range 17-25)  |
| PGY2         | 47     | 21.64 (75%; range 19-25)  |
| PGY3         | 39     | 20.95 (72%; range 18-24)  |
| PGY4         | 40     | 21.23 (73%; range 17-26)  |
| Gender       |        |                           |
| Male         | 13     | 20.57 (72%; range 18-24)  |
| Female       | 153    | 21.20 (73%; range 17-26)  |
| Age          |        |                           |
| 26-30        | 114    | 21.08 (73%; range 17-25)  |
| 31-35        | 50     | 21.32 (74%; range 18-25)  |
| 36-40        | 2      | 21.50 (74%; range 21-22)  |

Table Two: Fertility Items
| Fertility item                                           | Underestimating | Correct | Overestimating |
|----------------------------------------------------------|-----------------|---------|----------------|
| Age (y) of maximal fertility decline                     |                 | 35-39   |                |
| Responses                                                | 8               | 121     | 37             |
| Fecundability at age 30                                   |                 | 20%     |                |
| Responses                                                | 16              | 95      | 55             |
| Fecundability at age 40                                   |                 | <5%     |                |
| Responses                                                | N/A             | 111     | 55             |
| Miscarriage rate                                          |                 | 16-25%  |                |
| Responses                                                | 50              | 80      | 36             |
| IVF success rate at under age 35                          |                 | 41-60%  |                |
| Responses                                                | 80              | 62      | 18             |
| IVF success rate at age 44                                |                 | <5%     |                |
| Responses                                                | N/A             | 77      | 84             |
| IVF twinning rate                                         |                 | 21-35%  |                |
| Responses                                                | 131***          | 27      | 3              |
| Live birth per thawed egg after oocyte cryopreservation   |                 | <10%    |                |
| Responses                                                | N/A             | 8       | 155            |
| Sperm survival time                                       |                 | 3-5 days|                |
| Responses                                                | 71              | 93      | 2              |

** numbers may not add to total respondent population as some questions were left unanswered

***correct answer per latest SART data

Table Three: Risk Factors
| Risk factor                                | Correct Answer | N (%) answering correctly |
|-------------------------------------------|----------------|---------------------------|
| Smoking                                   | TRUE           | 163 (98%)                 |
| Being underweight                        | TRUE           | 165 (99%)                 |
| Prior use of oral contraceptive pills    | FALSE          | 163 (98%)                 |
| **Gonorrhea or Chlamydia infection**      | TRUE           | 161 (97%)                 |
| Occasional caffeine intake               | FALSE          | 154 (93%)                 |
| Obesity                                   | TRUE           | 165 (99%)                 |
| Safely-conducted pregnancy termination    | FALSE          | 162 (98%)                 |
| Using certain types of sexual lubricants  | TRUE           | 116 (70%)                 |
| Moderate alcohol consumption             | FALSE          | 79 (48%)                  |
| Male partner’s age                        | TRUE           | 122 (73%)                 |