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ORIGINAL ARTICLE

Approach of medicine academics on female fertility

Abordagem de acadêmicas de medicina sobre a fertilidade feminina

Bruna Eduarda Ribeiro Ramos[1], Beatriz Libero Abdalla[1], Ana Márcia de Miranda Cota[1]

ABSTRACT

Introduction: Motherhood at an advanced age has shown significant growth in Brazil in recent decades. Socioeconomic transformations have modified the role of women, increasing their autonomy in relation to the parental project. The postponement of motherhood can be a recurrent phenomenon for future doctors, since training in Medicine has a long duration. **Objective:** To evaluate the knowledge of medical students about reproductive health, through questions about reproductive senescence, fertility preservation techniques and desires related to motherhood, highlighting the importance of the topic for satisfactory family planning associated with the pursuit for a medical career. **Method:** Descriptive cross-sectional study, which analyzed the knowledge of 149 academics about reproductive health, through an online questionnaire. Data were analyzed using R software version 4.0.3. **Results:** Although aging determines a decline in female fertility, assisted reproduction technologies help those who opt for late motherhood. The training time was estimated at 11 years. Most students reported the desire to have biological children and were in favor of the possibility of postponing motherhood for professional reasons. Most erroneously reported that fecundity would be between 55-85%. 89.9% reported knowing what assisted reproduction is. Most students were not instructed about reproductive senescence and fertility preservation. **Conclusion:** The students have a limited understanding of reproductive health, probably due to the lack of medical guidance, in addition to insufficient family planning, which does not always consider the professional factor.

Keywords: Fertility preservation; Reproductive techniques; Family development planning; Medical students.

[1] Faculdade Ciências Médicas de Minas Gerais (FCM-MG), Belo Horizonte, Minas Gerais, Brazil.

Responsible Editor:
Dr. Henrique Vitor Leite
Faculdade de Medicina da Universidade Federal de Minas Gerais.
Belo Horizonte/MG, Brazil.

Corresponding author:
Bruna Eduarda Ribeiro Ramos
E-mail: brunaeduardarr@outlook.com

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RESUMO

Introdução: A maternidade em idade avançada apresentou crescimento significativo no Brasil nas últimas décadas. As transformações socioeconômicas modificaram o papel da mulher, aumentando a sua autonomia em relação ao projeto parental. O adiamento da maternidade pode ser um fenômeno recorrente para futuras médicas, uma vez que a formação em Medicina tem uma longa duração. **Objetivo:** Avaliar o conhecimento de estudantes de Medicina sobre saúde reprodutiva, através de perguntas sobre senescência reprodutiva, técnicas de preservação da fertilidade e desejos relacionados à maternidade, destacando a importância do tema para um planejamento familiar satisfatório associado à busca pela carreira médica. **Métodos:** Estudo descritivo transversal, que analisou o conhecimento de 149 acadêmicos sobre saúde reprodutiva, por meio de um questionário *online*. Os dados foram analisados no *software* R versão 4.0.3. **Resultados:** Embora o envelhecimento determine o declínio da fertilidade feminina, as tecnologias de reprodução assistida auxiliam aquelas que optam pela maternidade tardia. O tempo de formação foi estimado em 11 anos. A maioria dos estudantes relatou o desejo de ter filhos biológicos e se mostrou favorável à possibilidade de adiar a maternidade por motivos profissionais. A maioria relatou erroneamente que a fecundidade estaria entre 55-85%. 89,9% relataram saber o que é reprodução assistida. A maioria dos estudantes não foi instruída sobre senescência reprodutiva e preservação da fertilidade. **Conclusão:** As estudantes apresentam compreensão limitada sobre saúde reprodutiva, provavelmente pela falta de orientação médica associada a um planejamento familiar insuficiente, que nem sempre considera o fator profissional.

Palavras-chave: Preservação da fertilidade; Técnicas de reprodução assistida; Planejamento familiar; Estudantes de medicina.

Introduction

The possibility of choosing motherhood, as well as the number of children and when to have them, is a reality that accompanies socioeconomic and cultural transformations[1]. The conquests of social rights and the greater participation of women in academic spaces and in the job market have changed the historical conception of the female figure predestined to motherhood[1-4].

The dissemination of contraceptive methods and the advent of assisted reproduction techniques ensured greater autonomy for women in relation to the parental project and are related to the growing trend of postponing motherhood[5,6]. According to data from the Brazilian Ministry of Health, the number of live births by mothers in the 35-59 age group increased by 65.6% between 1995 and 2020 in Brazil[7].

The definition of advanced maternal age in the literature varies. Historically, advanced maternal age was first defined in 1958 by the Council of International Federation of Obstetrics as 35 years or more[8]. Some authors have shown that this limit is related to the decline in fertility and the progressive increase in the risk of genetic anomalies in children born to women aged 35 or over[9,10]. Advancing age progressively determines a decline in female fertility, since there is an inverse relationship between aging and the number of oocytes: at birth, women have about 1 to 2 million oocytes and, due to follicular atresia, this number tends to decrease throughout life, leaving around 1000 oocytes during menopause (on average at the age of 51)[11,12]. In addition, oocyte quality is impaired over time, with a prevalence of aneuploid oocytes, which decreases the probability of fertilization and increases the chances of chromosomal anomalies, miscarriage and pregnancy complications[11,12].

Although the chances of a woman getting pregnant through the menstrual cycle - fecundity rate - decrease with advancing age, postponing motherhood seems to be an option for those who wish to disassociate the beginning

of a professional career from motherhood[2-4,13]. Despite this reality, many women are unaware of the true impact of aging on their reproductive health, as well as the options available for fertility preservation[14,15].

The objective of this study was to evaluate the knowledge of female medical students at a private college in Belo Horizonte - Minas Gerais, Brazil - about reproductive senescence and fertility preservation, highlighting the importance of the subject for family planning satisfaction associated with pursuing a medical career.

Methods

This is a descriptive cross-sectional study conducted with the participation of medical students from a private college in Belo Horizonte, Minas Gerais, Brazil. The project was approved by the Research Ethics Committee of the college Faculdade Ciências Médicas de Minas Gerais (CAAE: 56352221.9.0000.5134; approval opinion number: 5.290.573) and carried out with the consent of the participants through the Free and Informed Consent Form.

The sample calculation was performed considering 5% of significance, 8% of error and a conservative approach for (which considers it as 50%). A total of 151 medical students were selected under the following inclusion criteria: being female, being 18 years of age or older and being a student in the Medicine course. After the selection, students from other colleges were excluded.

Participants who agreed to take part in the research answered a questionnaire containing objective questions about reproductive health. The questionnaire was applied virtually through the Google Forms platform. The answers that presented inconsistencies were not considered for the analysis.

Categorical variables were presented as absolute and relative frequencies and numeric variables as mean ± standard deviation and median (1st quartile - 3rd quartile). The analyses were carried out by using the R version 4.0.3 software.

Results

149 students with a mean age of 21.4 ± 2.4 years were evaluated. Responses were obtained from students from the 1st to the 11th semester of the Medicine course, with the highest percentage (31.1%) attending the 7th semester at the time of data collection (Table 1).

The average age of admission to college was 19.3 ± 2.2 years and all academics reported having plans to undertake a Medical Residency after course completion, with the specializations of greatest interest being Gynecology and Obstetrics (33.6%), Internal Medicine (30.2%) and Pediatrics (26.2%) (Table 1).

60.4% of the academics reported intending to pursue a master's degree and/or doctorate degree following graduation. On average, the students evaluated the training time, including undergraduate and graduate, at 10.4 ± 1.1 years, so that the estimated average age after completing the graduate course would be 29.6 ± 2.3 years (Table 1).

According to the data collected, none of the students had biological children, and 87.3% reported the desire to have - the majority (63.7%) would like to have 2 children. 65.3% of the students would like to have their first child between 31 and 35 years of age (Table 2).

Regarding the postponement of motherhood for academic and/or professional reasons, 81.2% of the students agreed with this possibility (Table 2).

To assess the academics' knowledge on female fertility, notions about reproductive senescence, fertility and fertility preservation were evaluated (Table 3).

All the surveyed students view aging as an impairment for female fertility. 73.2% of the academics reported knowing fertility (probability of getting pregnant in one menstrual cycle) up to 35 years of age, with the majority (71.9%) reporting that this rate would be between 55 and 85%. After the age of 40, 41.6% answered that the probability of becoming pregnant would be between 20 and 30%, 34.2% equal to or less than 5% and 20.1% between 40-50% (Table 3).

Despite 89.9% reported knowing what assisted reproduction is, most academics (58.4%) reported not knowing the cost of an assisted reproduction procedure (Table 3). 97.3% considered that the price could be a barrier to adherence. 21.5% of the respondents would not undergo assisted reproduction procedures (Table 3).

81.9% of the academics reported not having been advised about the impact of age on fertility and 79.9% did not receive guidance on fertility preservation methods from their gynecologists (Table 4). Despite that, most participants (81.2%) would like their gynecologist to discuss fertility preservation options (Table 4).

Discussion

The choices associated with motherhood are intrinsically related to women's participation in the job market[1]. The career-motherhood relationship can be affected according to the individual occupational planning, above all when it comes to the possible inconsistencies between the professional demands for availability and flexibility and the parental demands[1].

In this study respondents forecast Medicine course duration, including undergraduate and graduate, at approximately eleven years, so that the estimated average age after completing the graduate course would be around 30 years old. The long duration of medical training can result in personal impacts for future doctors and is currently associated with the growing trend of postponing motherhood.

Motherhood at the beginning of a professional career can result in lower financial returns as well as fewer opportunities in the job market[2-4]. An American survey showed that the postponement of motherhood can be beneficial, especially for recent graduates, as each year postponed after entering the job market results in a 2.9% increase in wage after a

Table 1. Characteristics of the population.

	Statistics
Age	21,4 ± 2,4 21,0 (20,0 - 23,0)
Period (n=148)	
1st period	20 (13,5)
2nd period	19 (12,8)
3rd period	11 (7,4)
4th period	12 (8,1)
5th period	10 (6,8)
6th period	15 (10,1)
7th period	46 (31,1)
8th period	7 (4,7)
9th period	2 (1,4)
10th period	4 (2,7)
11th period	2 (1,4)
Civil status	
Single	149 (100,0)
Sexual orientation	
Heterosexual	127 (85,2)
Bisexual	20 (13,4)
Homosexual	2 (1,3)
At what age did you start medical school?	19,3 ± 2,2 19,0 (18,0 - 20,0)
Do you plan to do any medical residency?	
Yes	149 (100,0)
No	0 (0,0)
Which residences?	
Gynecology and Obstetrics	50 (33,6)
Clinical medicine	45 (30,2)
Pediatrics	39 (26,2)
General surgery	35 (23,5)
Others	33 (22,1)
Urgency and emergency	28 (18,8)
Cardiology	18 (12,1)
Psychiatry	16 (10,7)
Plastic surgery	14 (9,4)
Dermatology	14 (9,4)
Legal Medicine	14 (9,4)
Family and Community Medicine	13 (8,7)
Cardiovascular surgery	12 (8,1)
Neurosurgery	12 (8,1)
Orthopedics/traumatology	10 (6,7)
Ophthalmology	9 (6,0)

Geriatrics	8 (5,4)
Anesthesiology	7 (4,7)
Head and neck surgery	7 (4,7)
Otorhinolaryngology	7 (4,7)
Pathology	6 (4,0)
Infectology	5 (3,4)
Pneumology	5 (3,4)
Radiology	5 (3,4)
Occupational Medicine	1 (0,7)
Urology	1 (0,7)
How long do you estimate your undergraduate + graduate degree will last? (n=133)	10,4 ± 1,1 10,0 (10,0 - 11,0)
Estimated age after graduation (n=133)	29,6 ± 2,3 29,0 (28,0 - 31,0)
Do you intend to pursue a master's, doctorate and/or postdoctoral degree?	
Yes	90 (60,4)
No	59 (39,6)

Table 2. Motherhood data.

	Statistics
Do you have biological children?	
Yes	0 (0,0)
No	149 (100,0)
Do you want to have biological children? (n=142)	
Yes	124 (87,3)
No	15 (10,6)
Do not know	3 (2,1)
If you want to have biological children, how many would you like to have? (n=124)	
1	11 (8,9)
2	79 (63,7)
3 or more	34 (27,4)
If you want to have biological children, at what age would you like to have your first child? (n=124)	
21-30 years	34 (27,4)
31-35 years	81 (65,3)
36-39 years	8 (6,5)
40-44 years	1 (0,8)
Would you postpone motherhood for academic/professional reasons?	
Yes	121 (81,2)
No	20 (13,4)
I don't want to have children	8 (5,4)

Table 3. Data on academics' knowledge about female fertility.

	Statistics
Do you think aging impairs female fertility?	
Yes	149 (100,0)
No	0 (0,0)
Do you know the fecundity rate (probability of getting pregnant in one menstrual cycle) of women up to 35 years old?	
Yes	40 (26,8)
No	109 (73,2)
What do you think is the probability of a woman getting pregnant by age 35?	
<15%	2 (1,3)
15-25%	13 (8,7)
35-45%	25 (16,8)
55-65%	50 (33,6)
75-85%	57 (38,3)
100%	2 (1,3)
What do you think is the probability of a woman getting pregnant after age 40?	
5% or less	51 (34,2)
5-10%	0 (0,0)
20-30%	62 (41,6)
40-50%	30 (20,1)
60-70%	6 (4,0)
80-90%	0 (0,0)
Do you know what assisted reproduction is?	
Yes	134 (89,9)
No	15 (10,1)
Do you know the difference between oocyte, embryo and ovarian tissue cryopreservation?	
Yes	60 (40,3)
No	89 (59,7)
Would you undergo assisted reproduction procedures?	
Yes	117 (78,5)
No	32 (21,5)
Do you know how much an assisted reproduction procedure costs?	
Yes	62 (41,6)
No	87 (58,4)
Do you consider that price can be a barrier for adherence to fertility preservation methods?	
Yes	145 (97,3)
No	4 (2,7)

period of 20 years[16]. 81.2% of the students in this study were in favor of the possibility of postponing motherhood for academic or professional reasons.

If, on one hand, the postponement of motherhood can contribute to greater professional success, on the other hand, it can have negative effects on the health of

Table 4. Data on medical guidelines.

	Statistics
Has your gynecologist ever advised you on the impact of age on fertility?	
Yes	27 (18,1)
No	122 (81,9)
Have you ever received guidance on fertility preservation methods?	
Yes	30 (20,1)
No	119 (79,9)
Would you like your gynecologist to discuss about fertility preservation options?	
Yes	121 (81,2)
No	28 (18,8)

the mother and child. Advanced maternal age, above 35 years, is related to an increase in perinatal complications, such as intrauterine growth restriction, preeclampsia, premature placental rupture, preterm delivery and stillbirths[17].

The chances of a woman getting pregnant and having a healthy newborn depend, among other factors, on fertility, the risk of miscarriage, chromosomal anomalies and obstetric complications[11,12]. All these elements are closely related to a woman's age - the impact of age on fertility seems to be higher in women aged 30 or over, but especially after 35 years[11,12]. Some studies have highlighted the adverse effect of aging on fertility derived from several researches of cumulative conception rates among women trying to become pregnant through artificial insemination with donor sperm. Overall, conception rates were found to be considerably lower in women over 30[18-21]. In our study, we found that 65.3% of students would like to have their first child between the ages of 31 and 35 - the age at which fecundity rates are already on the decline.

Female reproductive senescence is fundamentally due to the progressive and inevitable decrease in the population of ovarian follicles, which begins in fetal life and lasts until menopause[11,12]. Parallel to the reduction in the number of oocytes, there is a decline in their quality[8]. Advancing age brings about an increase in the prevalence of aneuploid oocytes, due to dysfunctions in meiosis, resulting in a lower probability of fertilization, higher rates of chromosomally abnormal embryos, higher rates of miscarriage and more complications in pregnancy[11,12].

Although fertility decreases with age, advances in medicine have enabled safe pregnancies at later ages, through fertility preservation and assisted reproduction techniques.

In this study, all the respondents reported aging as an impairment for female fertility, but most of them did not know that female fecundity decreases after the age of 35. Corroborating previous research findings, more than 70% of the surveyed students overestimated the likelihood of a woman getting pregnant up to the age of 35, responding that this rate would be between 44-85%, when, in fact, it is approximately 20-30% in normally fertile couples[13].

Although fertility decreases with age, advances in medicine have enabled safe pregnancies at later ages, through fertility preservation techniques - cryopreservation of oocytes, embryos and ovarian tissue - and assisted reproduction[14]. We identified that although almost 90% of the students knew what assisted reproduction is, most were unaware of fertility preservation options. In addition, although there is a lack of knowledge about the costs of treatments, almost 100% considered that the price could be a barrier to adherence.

Some studies have shown that women prefer to obtain reproductive health information from their health care providers, however, many professionals feel unprepared to this[14,22]. A recent study involving Obstetrics and Gynecology residents, which found that a minority of professionals believed that the discussion about the elective cryopreservation of oocytes should be started with the patients[14,22].

We found that about 80% of the students surveyed in our study did not get information from their gynecologists about the impact of age on both female fertility and fertility preservation methods - corroborating the deficit in the approach of health professionals. Despite that, most respondents expressed willingness to receive such information from their gynecologists.

Conclusion

Although most of the surveyed students have prior knowledge about embryology and female physiology, this study showed a limited understanding of reproductive health, probably due to the lack of medical guidance added to insufficient family planning, which does not always consider the professional factor.

The research showed that most of the respondents were adept at postponing motherhood for academic-professional reasons and reported the desire to have their first child between 31 and 35 years of age - by the time they would have already advanced in their medical training (despite the previously demonstrated significant impact on fertility). It is noteworthy that most of them overestimate the probability of getting pregnant in this age group.

Finally, the postponement of motherhood constitutes a public health problem and is a phenomenon on the rise. Through the creation of spaces for discussions and adequate medical guidance on reproductive health, efficient family planning will be possible while taking into consideration motherhood wishes and the individual professional context. Parental and occupational desires do not need to be mutually exclusive and access to information is essential for young women to build their future.

Authors' Contributions

We describe contributions to the papers using the taxanomy (CRediT) provide above:

Conceptualization, Investigation, Methodology, Visualization & Writing - review & editing: Author Bruna Eduarda Ribeiro Ramos; Author Beatriz Libero Abdalla; Author Ana Márcia de Miranda Cota. *Project administration, Supervision & Writing - original draft*: Author Bruna Eduarda Ribeiro Ramos; Author Beatriz Libero Abdalla; Author Ana Márcia de Miranda Cota. *Validation & Software*: Author Bruna Eduarda Ribeiro Ramos; Author Beatriz Libero Abdalla. *Resources & Funding acquisition*: Author Bruna Eduarda Ribeiro Ramos. *Data curation & Formal Analysis*: Author Bruna Eduarda Ribeiro Ramos; Author Beatriz Libero Abdalla; Author Ana Márcia de Miranda Cota.

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References

1. Speroff L, Hugh T, Pal L, Seli E. Clinical Gynecologic Endocrinology And Infertility. 9th ed. Holanda: Wolters Kluwer; 2020.
2. Miller AR. Motherhood Delay and the Human Capital of the Next Generation. Am Econ Rev. 2009;99(2):154–8. DOI: https://doi.org/10.1257/aer.99.2.154.
3. Buckles K. Understanding the Returns to Delayed Childbearing for Working Women. Am Econ Rev. 2008;98(2):403-7. DOI: https://doi.org/10.1257/aer.98.2.403.
4. Amuedo-Dorantes C, Kimmel J. The Motherhood Wage Gap for Women in the United States: The Importance of College and Fertility Delay. Rev Econ Household. 2005;3(1):17-48. DOI: https://doi.org/10.1007/s11150-004-0978-9.
5. Nazaré P, Pais A, Dias M. Adiar a maternidade: uma questão demográfica e contemporânea [dissertação]. Portugal: Faculdade de Medicina da Universidade de Coimbra; 2019; [access in 2024 may 11]. Available from: https://estudogeral.uc.pt/bitstream/10316/89675/1/TRABALHO%20FINAL%20PFN.pdf.
6. Bernardi D, Féres-Carneiro T, Magalhães A. Entre o desejo e a decisão: a escolha por ter filhos na atualidade. Contextos Clín. 2018;11(2):161-73. DOI: https://doi.org/10.4013/ctc.2018.112.02.
7. Ministry of Health (BR). DATASUS: Nascidos vivos no Brasil [Internet]. Brasília: Ministry of Health; 2022; [access in 2024 may 11]. Available from: http://tabnet.datasus.gov.br/cgi/tabcgi.exe?sinasc/cnv/nvuf.def.
8. Kirz DS, Dorchester W, Freeman RK. Advanced maternal age: the mature gravida. J Obstet Gynecol. 1985;152(1):7-12. DOI: https://doi.org/10.1016/s0002-9378(85)80166-6.
9. Cleary-Goldman J, Malone FD, Vidaver J, Ball RH, Nyberg DA, Comstock CH, et al. Impact of maternal age on obstetric outcome. FASTER Consortium. Obstet Gynecol. 2005;105:983-90. DOI: https://doi.org/10.1097/01.AOG.0000158118.75532.51.
10. Gill SK, Broussard C, Devine O, Green RF, Rasmussen SA, Reefhuis J, et al. Association between maternal age and birth defects of unknown etiology: United States, 1997-2007. Birth Defects Res A Clin Mol Teratol. 2012;94:1010-8. DOI: https://doi.org/10.1002/bdra.23049.
11. Pellestor F, Andréo B, Arnal F, Humeau C, Demaille J. Maternal aging and chromosomal abnormalities: new data drawn from in vitro unfertilized human oocytes. Hum Genet. 2003;112:195-203. DOI: https://doi.org/10.1007/s00439-002-0852-x.
12. Baker TG. A quantitative and cytological study of germ cells in human ovaries. Proceedings of the Royal Society. Biological Sciences. 1963;158(972):417–33. DOI: https://doi.org/10.1098/rspb.1963.0055.
13. Zinaman MJ, Clegg ED, Brown CC, O'Connor J, Selevan SG. Estimates of human fertility and pregnancy loss. Fertil Steril. 1996;65(3):503-9. DOI: https://doi.org/10.1016/S0015-0282(16)58144-8.
14. Hickman L, Fortin C, Goodman L, Liu X, Flyckt R. Fertility and fertility preservation: knowledge, awareness and attitudes of female graduate students. Eur J Contracept Reprod Health Care. 2018;23(2):130-8. DOI: https://doi.org/10.1080/13625187.2018.1455085.
15. Meissner C, Schippert C, Versen-Höynck. Awareness, knowledge, and perceptions of infertility, fertility assessment, and assisted reproductive technologies in the era of oocyte freezing among female and male university students. J Assist Reprod Genet. 2016;33(6):719-29. DOI: https://doi.org/10.1007/s10815-016-0717-1.

16. Herr J. Measuring the effect of the timing of first birth on wages. J Popul Econ. 2016;29:39-72. DOI: https://doi.org/10.1007/s00148-015-0554-z.

17. Lean S, Derricott H, Jones R, Heazell A. Advanced maternal age and adverse pregnancy outcomes: A systematic review and meta-analysis. PLoS ONE. 2017;12(10):e0186287. DOI: https://doi.org/10.1371/journal.pone.0186287.

18. van Noord-Zaadstra BM, Looman CW, Alsbach H, Habbena JDF, te Velde ER, Karbaat J. Delaying child-bearing: effect of age on fecundity and outcome of pregnancy. Br Med J. 1991;302(6789):1361-5. DOI: https://doi.org/10.1136/bmj.302.6789.1361.

19. Schwartz D, Mayaux MJ. Female fecundity as a function of age: results of artificial insemination in 2193 nulliparous women with azoospermic husbands. Federation CECOS. N Engl J Med. 1982;306(7):404-6. DOI: https://doi.org/10.1056/NEJM198202183060706.

20. Virro MS, Shewchuk AB. Pregnancy outcome in 242 conceptions after artificial insemination with donor sperm and effects of maternal age on the prognosis for successful pregnancy. Am J Obstet Gynecol. 1984;148(5):518-24. DOI: https://doi.org/10.1016/0002-9378(84)90739-7.

21. Shenfield F, Doyle P, Valentine A, Steele SJ, Tan S-L. Effects of age, gravidity and male infertility status on cumulative conception rates following artificial insemination with cryopreserved donor semen: analysis of 2998 cycles of treatment in one centre over 10 years. Hum Reprod. 1993;8(1):60-4. DOI: https://doi.org/10.1093/oxfordjournals.humrep.a137875.

22. Yu L, Peterson B, Inhorn M, Boehm J, Patrizio P. Knowledge, attitudes, and intentions toward fertility awareness and oocyte cryopreservation among obstetrics and gynecology resident physicians. Hum Reprod. 2016;31(2):403-11. DOI: https://doi.org/10.1093/humrep/dev308.