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Greek Medical Student's Knowledge and Attitudes towards Infertility and Assisted Reproductive Technologies (Greek Medical Students and ART)

Vassiliki Fotopoulou[1], Anthia Chasiakou[1], Alexandros Gryparis[2] and Stavroula Baka[1]

[1]Department of Biopathology, Aretaieio Hospital, National and Kapodistrian University of Athens, Athens, Greece
[2]Department of Hygiene, Epidemiology and Medical Statistics, National and Kapodistrian University of Athens, Athens, Greece

Abstract

Background: Infertility is a common medical condition with different implications. Previous work has demonstrated that university students present significant gaps in their perception regarding infertility and assisted reproduction technologies (ART), and postpone parenthood until the completion of their studies or even after achieving a stable career. We aimed to assess female medical students' knowledge and attitudes toward assisted reproduction, fertility preservation and infertility treatments, and possible impact on career and family planning.

Methods: We recruited students aged 18 to 26 years old, who completed a questionnaire regarding female fertility, ART and impact on future planning.

Results: Most of the 422 respondents were aware of ART, but were not familiar with ovarian tissue cryopreservation and vitrification. Almost 50% of participants agreed to evaluate their ovarian reserve. However, if informed of a decreased ovarian reserve, 60% would consider conceiving earlier, 70% to cryopreserve oocytes and 80% to adopt, while only a small percentage would stop or postpone education or career to build a family.

Conclusions: Greek medical students were aware of ART and interested in ovarian reserve testing. Gaps in knowledge about novel methods and procedures regarding ART and female fertility were identified.

Introduction

Infertility is nowadays a common medical condition with social, emotional and psychological implications, displaying increasing rates in Europe and worldwide [1]. Infertility is a more stressful experience for women since it increases as women age [2,3]. Age-related fertility decline encompasses a decrease in oocyte number and quality, which can increase the occurrence of chromosomal anomalies and complications during pregnancy [4]. However, the continuing development of assisted reproductive technologies (ART) made available different clinical and laboratory procedures which can improve reproductive outcome [5].

Academics and healthcare professionals have repeatedly stressed out the need to increase population awareness regarding fertility and infertility issues and the early 20's is probably the optimal time to do so. Previous work has demonstrated that university students present significant gaps in their perception of female infertility risk factors and ART, and postpone parenthood until the completion of their studies or even after achieving a stable career [3,6-15].

To the best of our knowledge, this is the first survey of its kind in Greece and was conducted on female medical students because of the long period of time required to complete undergraduate and postgraduate studies that might affect reproductive plans. Since some of the infertility risks can be prevented, we aimed to investigate Greek female medical students' awareness toward reproductive health issues, fertility preservation, infertility treatments, as well as their interest in assessing their ovarian reserve and how a hypothetical infertility could affect life strategy and future family planning.

Materials and Methods

Data included in the study was collected during the second semester of the 2013/2014 academic year. Over a period of two weeks, female medical students aged 18 to 26 years old were recruited from the National and Kapodistrian University of Athens to complete a questionnaire, based on a previous publication [16]. Permission to use part of the questionnaire in the present study was given by all three authors, Brindha Bavan, Ellen Porzig and Valerie L. Baker**.** The survey comprised thirty-three items, addressing a variety of issues, concerning socio-demographic information, family history regarding reproductive health, career and family aspirations and hypothetical impact of infertility, interest in assessing ovarian reserve, general reproductive health and assisted reproductive technologies knowledge. Finally, responders had to answer whether they "know infertile people who had or are using ART" and which were their infertility and ART information sources. Participants had to state the degree of agreement/disagreement with each attitude/opinion statement, using a 4-point Likert scale that ranged from "strongly agree" to "strongly disagree", their possible life changing attitudes in the event of unfavourable fertility test results and hypothetical infertility.

Before initiation of the study, approval was obtained from the Ethics Committee of Aretaieio University Hospital. After requesting permission and explaining the scope of the study, a total of 450 questionnaires were distributed in the main auditorium, at the end of different lectures, by the authors themselves to all attending female students. The completion of the survey was voluntary and no fee was received by the participants who were assured about anonymity and confidentiality. The response rate was 93.8% since 422 students agreed to participate, signed and completed the questionnaire. Nineteen students denied participation, while nine surveys were incomplete containing only demographic data, and were not included in the analysis. On average, 20 minutes were required to complete the questionnaire.

Collected data were analyzed using SPSS 17.0 edition (Chicago, IL) for descriptive statistics and frequencies regarding participants' answers.

***Corresponding author:** Stavroula Baka, Associate Professor, Department of Bio pathology, Aretaieio Hospital, National and Kapodistrian University of Athens, Athens, Greece, Tel: 302107286150; E-mail: sbaka@aretaieio.uoa.gr

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Results

Students' mean age was 20 years (SD, 1.75) and 66% of them attended the preclinical first three years of studies. None of the students were adopted and 4 were conceived using in vitro fertilization (IVF). Only two had children, while 60% desired to get pregnant in the next 5 to 10 years.

Ninety-four percentage of the respondents declared that they are aware of ART and 5% that they know very little about this subject, while 63% personally knew infertile people that have used or are using ART.

Question	Yes	No
Are you familiar with the following methods:		
Intra-uterine insemination	321 (76.1)	101 (23.9)
In vitro fertilization	336 (79.6)	86 (20.4)
Intracytoplasmic sperm injection	235 (55.7)	187 (44.3)
Oocyte, embryo, blastocyst cryopreservation	234 (55.5)	188 (44.5)
Ovarian tissue cryopreservation	100 (23.7)	322 (76.3)
Vitrification	34 (8.1)	388 (91.9)
Surrogacy	393 (93.1)	29 (6.9)
Donor egg	369 (87.4)	53 (12.6)
Are you aware of the following ovarian reserve tests:		
Ultrasonography	198 (46.9)	224 (53.1)
FSH	280 (66.4)	142 (33.6)
Anti-Müllerian hormone	145 (34.4)	277 (65.6)
Would submit to ovarian reserve testing in general	235 (55.7)	187 (44.3)
Would be interested in ovarian reserve testing now	222 (52.6)	200 (47.4)
Would be interested in ovarian reserve testing in 5 years	241 (57.1)	181 (42.9)
Would be interested in ovarian reserve testing in 10 years	314 (74.4)	108 (25.6)
Ovarian reserve needs to be known beforehand	307 (72.7)	115 (27.3)
If no insurance coverage would you pay for tests	281 (66.6)	141 (33.4)

Table 1: Assisted reproduction technologies and ovarian reserve assessment quiz, n (%).

When asked about the information source regarding ART, 37% answered that all the information was obtained from the Internet, books, journals or/and TV, 29% from the university, 19% from family members, 9% from health professionals, 4% from scientific meetings, 2% from friends and 1% stated "none" since they were not aware of ART.

As shown in Table 1, more than 90% of the students were aware of surrogacy, almost 80% were familiar with intra-uterine insemination (IUI), IVF and donor egg procedures, 50% knew about intra-cytoplasmic sperm injection (ICSI) and cryopreservation of oocytes, embryos and blastocysts, although a significant lack of knowledge was noted regarding ovarian tissue cryopreservation and vitrification, in particular. When inquired about the ovarian reserve tests, almost 70% knew about FSH and 50% about ultrasonography; however, 65% failed to identify anti-Müllerian hormone as a method used for ovarian reserve testing. Furthermore, 50% agreed to submit to these tests now, 57% in 5 years and 75% in 10 years. Finally, 70% of the participants considered important the information about ovarian reserve before planning for a family and offered to cover the cost if health insurance is unavailable.

If informed of a decreased ovarian reserve, based on the abovementioned tests, the vast majority of these young women did not consider to get married earlier, although they would consider conceiving earlier (Table 2). Interestingly, most of the surveyed population agreed or strongly agreed to adopt or to cryopreserve gametes but did not consider opting for embryo cryopreservation or donor egg program. When hypothetically faced with the dilemma to stop or to postpone education and/or subsequently work, a small percentage agreed with this option, while 80% declared that, in spite of the possibility of a low fertility potential, they will pursue their career.

Students' responses for 1 multiple choice and 9 true/false questions regarding age-related fertility decline and ovarian reserve are presented in Table 3. Four issues gathered a significant number of incorrect

Actions If Unfavorable Fertility Tests Results	Strongly Agree	Agree	Disagree	Strongly Disagree
Get married earlier	15 (3.5)	102 (24.2)	229 (54.3)	76 (18.0)
Conceive earlier	62 (14.7)	193 (45.7)	133 (31.5)	34 (8.1)
Oocyte cryopreservation	86 (20.4)	223 (52.8)	91 (21.6)	22 (5.2)
Embryo cryopreservation	16 (3.8)	65 (15.4)	228 (54.0)	113 (26.8)
Donor egg	6 (1.4)	64 (15.2)	234 (55.4)	118 (28.0)
Adoption	81 (19.1)	258 (61.1)	71 (16.8)	12 (2.8)
Stop education/work	3 (0.7)	6 (1.4)	152 (36.0)	261 (61.9)
Postpone education/work	3 (0.7)	35 (8.3)	186 (44.1)	198 (46.9)
Continue education/work	113 (26.8)	216 (51.2)	66 (15.6)	27 (6.4)

Table 2: Impact of fertility tests on family planning and career, n (%).

Question	Answer	Correct answers n (%)
Multiple choice		
Women ability to conceive starts to decline at what age	30-34	67 (15.9)
True/False		
At birth women have the maximum number of oocytes	TRUE	392 (92.9)
Smoking can decrease fertility in women	TRUE	385 (91.2)
Women on oral contraceptives preserve a healthy oocyte supply	FALSE	139 (32.9)
Regular menstrual cycles while using oral contraceptives assures a healthy oocyte supply	FALSE	283 (67.1)
In vitro fertilization allows conception even with extremely reduced oocyte supply	FALSE	22 (5.2)
Oocyte supply vary among women even of same age	TRUE	399 (94.5)
Exercise and healthy diet preserve oocyte supply	FALSE	57 (13.5)
Before undergoing cancer treatment women can freeze their oocytes	TRUE	383 (90.8)
Family history of early menopause may put women at risk for primary ovarian insufficiency	TRUE	312 (73.9)

Table 3: Reproductive health knowledge quiz.

answers. Specifically, 84% believed that women fertility starts to decline over the age of 35 (49% between 35-40, 33% between 41-45 and 2% from 46-50), 67% that contraceptives are beneficial in preserving oocyte supply, 95% that IVF definitely can assure conception even when the oocyte supply is dramatically reduced, and, finally, 86% responded that oocyte supply can be preserved by exercise and healthy diet.

Discussion

Our data identify knowledge gaps and misconceptions surrounding reproductive health and ART in a group of medical students and adds to existing evidence regarding lack of fertility awareness among university students [8,11,17]. Participants demonstrated awareness regarding most of the ART but were less able to identify the relatively novel techniques such as vitrification and ovarian tissue cryopreservation. As previously suggested [18,19] and in concordance with our results, in an era characterized by an increased use of electronic media, medical websites have been recognized as the main source of information regarding reproductive health issues and ART. Interestingly, this highlights the importance of this venue not only for the young generation, but also for the general population who seeks Internet-based health information [20]. It has been demonstrated that when patients are better informed they can interact more effectively with healthcare providers and take actions that benefit their health. This approach was used in Leonardo Project with excellent results [21]. The project used trained nurses as care managers serving as a bridge between physicians, specialists, and patients. Care managers worked directly with the patients through phone calls interviews, internet, or even visits at home, providing information, educational material as well as an individualized care plan tailored to each patient's needs, always in conformity to physicians' recommendations. This model demonstrated the usefulness of incorporating care managers in a specialized role, into the primary healthcare system. Future studies should consider the possibility of incorporating this model, in an attempt to provide the necessary information and advice, and promote appropriate management regarding reproductive health issues and ART.

Women's fertility starts to decline around the age of 30, while around 35 the decline accelerates [22]. Impressively, only 16% of our subjects were aware of the age at which female fertility starts to decline, result which is in line with other studies showing that students [13,23] and even health studies students tend to overestimate the age-dependent fertility decline, and is different from one third of correct answers received in a representative sample of San Francisco Bay area students and in Australians of reproductive age. Thirty-five percent of our respondents indicated that female fertility decreases after 40 years of age which is somewhat similar with half of the Canadian students sharing the same opinion. Lack of awareness about the negative impact of age on fertility may result in delayed childbearing [7,13,16,18].

Despite women's shorter fertility lifespan, during the last decades, the trend and in fact the social reality is that women postpone childbearing late in their 30's [9]. Nowadays, women have included exercise and diet in their daily routine and this has become synonymous to health. This modern lifestyle trend may reflect the tendency to consider health and fitness better predictors of fertility than age [9,24]. In concordance to previous work [9,16,24] a significant part of our students had unrealistic perceptions that, by using contraceptives as well as by adhering to a healthy diet together with exercise, they could preserve their oocyte supply. This misconception can have severe repercussions later when these women could be faced with infertility despite having no history of medical problems. Furthermore, as noted by other researchers and us, many university students exhibit unrealistically optimistic perceptions of ART effectiveness, overestimating the ability of treatments such as IVF to compensate for any age-related fertility decline [3,7,8,10,13,23] that could be attributed, at least in part, to media coverage of late and even very late pregnancies following ART. On the other hand, research confirms that exposing university students to a brief educational intervention increased their knowledge of age-related fertility decline and IVF effectiveness [10].

The American College of Obstetricians and Gynecologists has emphasized the significance of women's knowledge and attitudes towards reproductive health before planning for a pregnancy [25]. Most of our students were interested in submitting to ovarian reserve testing in the next 10 years and responded that it is important to have information about ovarian reserve before planning for a family. Although expense was identified as a concern for IVF [13], our participants offered to cover the cost for these tests if health insurance was unavailable. Our findings are similar with previous research [16] and highlight the need for increased awareness surrounding ovarian reserve decline since women's age at first birth has increased dramatically worldwide over the past decades.

Almost 65% of the respondents in this study wished to have children in the future, which is less than the impressive 97% of the Swedish students although the age at which they would like to start a family is when women's fertility is already on decline [23]. However, if informed of a decreased ovarian reserve, the vast majority of our respondents did not consider to get married earlier, although they would consider conceiving earlier. Furthermore, 80% declared that, in spite of the possibility of a low fertility potential, they will pursue their career.

Similar to previous reports [16,24] most of our students opted for gamete rather than embryo cryopreservation or donor oocytes. This may reflect a negative approach for using third-party treatment options that involves significant ethical, legal and social problems, irrespective of childbearing intentions, suggesting that they prefer using their own genetic material for family-building purposes. It may well be that these young women are very optimistic about their ability to reproduce and/or overconfident about ART [16]. Interestingly, in concordance to studies on different groups of students [13,16] our surveyed sample felt strongly positive about adoption as a solution for infertility.

This study has several limitations. As medical students, our participants represent a privileged sample in terms of access to reproductive health information. A cohort of age-matched university, non-medical, students may have different perceptions and awareness of reproduction and infertility. Thus, our results cannot be translated to the general population and can only mark a trend which needs further testing through future research. On the other hand, the results of our study are not representative for the medical school in general since only a small proportion of the female medical school student population was investigated and the majority of the students recruited were in the preclinical years of studies. Moreover, since our sample consisted exclusively of women, it should be stressed out the importance of testing men's awareness about infertility and reproductive health issues in general, and this must be regarded as another limitation of this study. Finally, it is important to take into consideration that some of the questions included were hypothetical and the respondents had to anticipate future actions. Furthermore, the use of a structured interview containing limited information can easily alter the decision quality of the respondents. Identifying the factors that may influence participants' decisions and using an adequate amount of information could provide a better insight into the students' values and guidance in the decision-making process.

Conclusion

Our findings provide an interesting snapshot of the knowledge and attitudes toward infertility and ART as well as childbearing intentions and family-building options, of a specific cohort of young women that could be used for future educational programs regarding reproductive health issues.

Author Disclosure Statement

The authors declare that no competing financial interests exist.

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