



Infertility Knowledge, Attitudes, and Beliefs among Iranian College Students

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Abstract

The knowledge, attitudes and beliefs of college students about infertility was assessed. A questionnaire was designed. The target population was students attending a college located in Fooladshahr, Isfahan, Iran. The main research outcome measures for this study were to determine the infertility knowledge, attitudes and beliefs among these students. Our results demonstrated that there are differences in knowledge, attitudes and beliefs of students based on gender. A greater proportion of female students answered more questions correctly in comparison to their male counterparts. Also the majority of students knew about some of the biological and lifestyle factors related to infertility, including that infertility is a problem for both men and women, and the effects of genetics, abnormal sperm production and/or function, blocked fallopian tube and environmental factors on fertility. However, there were notable gaps in fertility knowledge in some areas, such as the most fertile time in a woman's menstrual cycle, the age range with a marked decrease in a woman's ability to become pregnant, negative effects of advanced age on men's fertility, and negative effects of genital tract infection, being underweight or overweight, smoking, alcohol, psychological stress and sexually transmitted infection. In Conclusion the awareness of female students in some cases is significantly more than that of males. It also appears that there is an overall perception that women are more likely to become infertile due to any number of causes that are, in fact, of equal risk to both men and women.

Keywords: Infertility, Knowledge, Students, Attitude

1 Introduction

Nowadays, infertility is an important public health problem worldwide that affects many couples and leads to a vast range of social, personal, familial and emotional problems (1-2). Infertility is one of the major concerns of fertility specialists. It is suggested that a high rate of infertility is mainly related to a wide gap in peoples' awareness about infertility risk factors and the causes of infertility (3-4). Awareness of married and even single people about infertility as a medical issue will help them to know the causes of infertility and prevent its occurrence; it will also help infertility specialists to diagnose it precisely for its treatment (5). It is determined that beliefs about infertility differ significantly among people and are related to age, marital status, gender and educational level (3, 6-7). Studies show that increasing age, sexually transmitted disease, incorrect lifestyle and environmental pollutions are

among the important factors that cause infertility or infertility-related problems (7-13). Some studies have shown that students are not aware of many basic concepts, such as a woman's fertility window and the age at which fertility begins to decline. They also do not know the preventable factors of infertility (3, 5, 7-9). It has been shown that sexually transmitted diseases, which can affect fertility potential, especially in girls, are becoming increasingly prevalent among teenagers (14-15). It is known that knowledge about infertility is inadequate, and even if present, there are numerous misconceptions regarding infertility in many parts of the world (3, 5, 9, 16-17).

A global survey of almost 17,500 women (mostly of childbearing age) from 10 countries revealed that knowledge regarding fertility and the biology of reproduction is poor (18). Amazingly, many women have little awareness about the period of the month in which the occurrence of

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conception is high. Additionally, they are unaware of when should they seek infertility treatment (9, 19).

In Iran, it is shown that currently the mean age of the first-time mothers is relatively high (20) and the incidence and prevalence of sexually transmitted diseases (STIs) are much higher than the registered data suggest (21-22). Furthermore, studies have demonstrated that the knowledge of students and people about infertility risk factors is low (3, 23). In Iran, as in many other countries, there exist no comprehensive surveys with regard to infertility and attitudes among students in Iran. Most studies have focused on sexual health knowledge and practice (14, 24). Thereby, evaluating students' knowledge and then providing knowledge about infertility and its risk factors to young people is a necessity for preventing and decreasing the incidence of infertility. Although there are many studies related to these factors, it seems that the awareness of young people and their attitudes about infertility have not yet been comprehensively evaluated. The purpose of this study was to achieve a better understanding of the level of awareness, attitudes and beliefs about infertility among Iranian college students and to examine the effects of gender on responses.

2 Materials and Methods

2.1 Participants

For this study, the students of Jami Institute of Technology served as the target population.

2.2 Survey Questionnaire Items

A pretest questionnaire was designed after a thorough literature review and using questions adapted from other studies (7-9), as well as several questions developed specifically for this study population. The questionnaire contained demographic information including gender, age, questions about participants' beliefs and knowledge about infertility, with a multiple choice answer or three answer choices, "Yes," "No," and "I don't know," with only one right answer among the available choices (Table 1) and also questions about basic infertility knowledge and participants' views and questions about which approach(s) are the best to improve college students' knowledge in this area. It should be mentioned that the questionnaire's reliability and validity was checked by pre-sampling of 15 students. In this introductory step, the sample of size $n=15$ was chosen randomly and Cronbach's alpha was calculated. The value of Cronbach's alpha was about 0.8.

2.3 Data Collection Protocol

Students who were attending classes in any of the courses of the mentioned college during were sampled. The number of participants in this study was 170 (111 men and 59 women) who were chosen from the aforementioned areas with no regard to marital status, number of children or other criteria. A simple random sampling (SRS) method was utilized for sampling. The questionnaire was then distributed among participants. The students filled out the two-page questionnaire during their free periods between classes. Once completed, each questionnaire was immediately checked by the coordinator to ensure that all questions had been answered. The participants were also informed of the confidentiality of their information. For consistency in data

collection, the survey was administered by a single coordinator who was also aware of the questions and could explain all of them.

2.4 Data Analyses

Since previous studies have shown that there are differences between males' and females' awareness about the causes of infertility and beliefs (6-8), results were analyzed by gender. Data were analyzed using SPSS 16 software (IBM Corporation, Armonk, NY). The comparison process was conducted using the Mann-Whitney nonparametric test.

3 Results and Discussion

A total of 170 surveys were returned (111 male and 59 female students). The average age of female and male students was 26.6 and 25.8, respectively. According to Table 1, 67.57% of males and 62.71% of females correctly knew the description of infertility. Only 21.9% of males and 32.14% of female students correctly knew that the most fertile time in a woman's menstrual cycle occurs in the middle of her cycle. 57.29% of male and 63.16% of female students knew the age at which women are most fertile. Most students overestimated that female fertility decreases between ages 40-44, while 27.81% of males and 36.21% of females correctly answered. Most students believed that infertility is a disease (males: 58.18%; females: 61.02%).

Males were significantly more aware than females about the negative effects of advanced age on men's fertility (males: 47.66%; females: 28.81%; $p=0.006$). The majority of students, however, knew that both males and females could be responsible for infertility (males: 94.55%; females: 94.92%). Females were significantly more aware about the relation between men's (male students: 59.81%; female students: 81.03%, $p=0.008$) and women's (male: 59.43%; females: 31%) genetics with infertility ($p=0.024$ respectively). Females were significantly more aware about the relationship between men's (male students: 49.07%; female students: 65.52%, $p=0.045$) and women's (males: 53.21%; females: 84.48%, $p=0.000$). genital tract infection with infertility. Female awareness about the relationship between an irregular menstrual cycle and infertility was significantly higher than that of males (male students: 34.58%; female students: 68.97%; $p=0.000$). Female students were more aware about the negative effects of underweight or overweight in men (males: 15.24%; females: 24.14%) and women (males: 19.44%; females: 63.16%) on fertility, and in the case of women's weight, female awareness was significantly higher than males ($p=0.000$). Females were more aware about the negative effects of alcohol consumption by men (males: 33.03%; females: 37.93%) and women (males: 35.78%; females: 52.54%) on fertility, and females awareness about this issue in males was significant ($p=0.000$). Additionally, females possessed significantly more awareness about secondary infertility (males: 43.12%; females: 61.02%; $p=0.031$). The awareness of students about the negative effects of smoking on men's (males: 33.64%; females: 33.9%) and women's fertility (males: 41.28%; females: 55.17%) showed no significant difference ($p>0.05$).

Table 1: Students' knowledge and beliefs about infertility

* Correct answer

Question	Responses	Male Responses n (%)	Female Responses n (%)	Male Mean Rank	Female Mean Rank	P Value
Infertility Knowledge						
What is the correct description of infertility?	A woman's failure to conceive after experiencing intercourse for a year without use of contraception*	75 (67.57)	37 (62.71)	84.50	80.15	0.493
	A woman's failure to conceive after the first intercourse	1 (0.9)	2 (3.39)			
	I do not know	32 (28.83)	18 (30.51)			
When is the most fertile time in a woman's menstrual cycle?	Beginning	16 (15.24)	2 (3.57)			
	Mid-cycle *	23 (21.9)	18 (32.14)	79.43	83.95	0.532
	End of cycle	14 (13.33)	18 (32.14)			
	Throughout the cycle	6 (5.71)	0 (0.00)			
	I do not know	46 (43.81)	18 (32.14)			
At what age does a woman have the greatest fertility potential?	15-24	7 (7.29)	0 (0.00)			
	20-24 *	55 (57.29)	36 (63.16)	79.27	84.08	0.464
	25-29	34 (35.42)	21 (36.84)			
	30-44	0 (0.00)	0 (0.00)			
	At all ages	6 (6.25)	2 (3.51)			
In what age range is there a marked decrease in a woman's ability to become pregnant?	25-34	5 (4.81)	3 (5.17)			
	35-39 *	29 (27.88)	21 (36.21)	79.09	85.83	0.273
	40-44	64 (61.54)	33 (56.90)			
	In all ages	6 (5.77)	1 (1.72)			
Do you think infertility is a disease?	Yes *	64 (58.18)	36 (61.02)	82.23	79.95	0.741
	No	39 (35.45)	20 (33.90)			
	I do not know	7 (6.36)	3 (5.08)			
Infertility beliefs						
Advanced age has negative effects on men's fertility	Yes *	51 (47.66)	17 (28.81)	90.57	70.69	0.006
	No	35 (32.71)	32 (54.24)			
	I do not know	21 (19.63)	10 (16.95)			
Infertility is a problem only for men	Yes	1 (0.92)	0 (0.00)			
	No *	106 (97.25)	58 (100.00)	84.31	82.00	0.202
	I do not know	2 (1.83)	0 (0.00)			
Infertility is a problem only for women	Yes	1 (0.91)	2 (3.39)			
	No *	107 (97.27)	57 (96.61)	84.79	85.40	0.792
	I do not know	2 (1.82)	0 (0.00)			
Infertility is a problem for both men and women	Yes *	104 (94.55)	56 (94.92)	84.90	85.18	0.929
	No	3 (2.73)	2 (3.39)			
	I do not know	3 (2.73)	1 (1.69)			

Question	Responses	Male Responses n (%)	Female Responses n (%)	Male Mean Rank	Female Mean Rank	P Value
Infertility risk factors						
Genetics (men)	Yes *	64 (59.81)	47 (81.03)	76.97	94.12	0.008
	No	21 (19.63)	6 (10.34)			
	I do not know	22 (20.56)	5 (8.62)			
Genetics (women)	Yes *	63 (59.43)	46 (79.31)	76.35	90.73	0.024
	No	21 (19.81)	7 (12.07)			
	I do not know	22 (20.75)	5 (8.62)			
Genital tract infection (men)	Yes *	53 (49.07)	38 (65.52)	78.62	92.59	0.045
	No	15 (13.89)	5 (8.62)			
	I do not know	40 (37.04)	15 (25.86)			
Genital tract infection (women)	Yes *	58 (53.21)	49 (84.48)	79.14	100.66	0.000
	No	12 (11.01)	3 (5.17)			
	I do not know	39 (35.78)	6 (10.34)			
Irregular menstrual cycle	Yes *	37 (34.58)	40 (68.97)	74.11	99.40	0.000
	No	26 (24.30)	10 (17.24)			
	I do not know	44 (41.12)	8 (13.79)			
Being underweight or overweight (men)	Yes *	16 (15.24)	14 (24.14)	78.27	88.75	0.141
	No	52 (49.52)	23 (39.66)			
	I do not know	37 (35.24)	21 (36.21)			
Being underweight or overweight (women)	Yes *	21 (19.44)	36 (63.16)	71.54	104.71	0.000
	No	48 (44.44)	9 (15.79)			
	I do not know	39 (36.11)	12 (21.05)			
Smoking (men)	Yes *	36 (33.64)	20 (33.90)	86.95	77.25	0.187
	No	48 (44.86)	26 (44.07)			
	I do not know	23 (21.50)	13 (22.03)			
Smoking (women)	Yes *	45 (41.28)	32 (55.17)	80.03	91.47	0.117
	No	34 (31.19)	14 (24.14)			
	I do not know	30 (27.52)	12 (20.69)			
Alcohol (men)	Yes *	36 (33.03)	22 (37.93)	74.06	102.68	0.000
	No	41 (37.61)	19 (32.76)			
	I do not know	32 (29.36)	17 (29.31)			
Alcohol (women)	Yes *	39 (35.78)	31 (52.54)	79.88	93.04	0.074
	No	35 (32.11)	15 (25.42)			
	I do not know	35 (32.11)	13 (22.03)			
A couple who have a child may have difficulty conceiving again	Yes *	47 (43.12)	36 (61.02)	79.01	94.64	0.031
	No	37 (33.94)	13 (22.03)			
	I do not know	25 (22.94)	10 (16.95)			
Abnormal sperm production and/or function	Yes *	88 (80.73)	49 (83.05)	83.82	85.75	0.715
	No	2 (1.83)	1 (1.69)			
	I do not know	19 (17.43)	9 (15.25)			
Blocked fallopian tube	Yes *	88 (80.73)	53 (89.83)	78.33	83.63	0.302
	No	5 (4.59)	3 (5.08)			
	I do not know	16 (14.68)	3 (5.08)			
Environmental factors (lead, radiation)	Yes *	79 (73.15)	47 (81.03)	81.07	88.02	0.234
	No	8 (7.41)	2 (3.45)			
	I do not know	21 (19.44)	9 (15.52)			
Psychological stress						
	Yes *	43 (39.81)	23 (38.98)	84.93	82.31	0.720
	No	23 (21.30)	15 (25.42)			
	I do not know	42 (38.89)	21 (35.59)			
Sexually transmitted infection (men)						

Question	Responses	Male Responses n (%)	Female Responses n (%)	Male Mean Rank	Female Mean Rank	P Value
	Yes *	42 (39.25)	28 (48.28)	80.55	87.53	0.326
	No	14 (13.08)	7 (12.07)			
	I do not know	51 (47.66)	23 (39.66)			
Sexually transmitted infection (women)						
	Yes *	39 (36.45)	37 (62.71)	73.62	99.17	0.000
	No	15 (14.02)	2 (3.39)			
	I do not know	53 (49.53)	20 (33.90)			
Infertility is 100% curable						
	Yes	18 (16.67)	10 (17.86)			
	No *	57 (52.78)	36 (64.29)	84.61	78.43	0.376
	I do not know	33 (30.56)	10 (17.86)			
Preservation of fertility and childbearing is important for me						
	Yes	101(94.39)	52 (88.14)	86.54	79.47	0.059
	No	6 (5.61)	7 (11.86)			
I am concerned about my ability to have children						
	Yes	45 (42.86)	34 (57.63)	78.14	90.25	0.070
	No	60 (57.14)	25 (42.37)			
If I discovered that I was infertile, I would be upset						
	Yes	82 (76.64)	51 (87.93)	77.07	90.11	0.012
	No	25 (23.36)	7 (12.07)			
I ashamed to ask questions about infertility						
	Yes	38 (35.19)	18 (30.51)	72.54	79.80	0.276
	No	70 (64.81)	41 (69.49)			
I would like to have more knowledge about fertility preservation and infertility risk factors						
	Yes	103 (95.37)	53 (89.83)	94.22	91.29	0.371
	No	5 (4.63)	6 (10.17)			
To whom would you prefer to go first for treatment?						
	Gynecologist	75 (68.18)	51 (86.44)	70.14	87.6	0.031
	Others					

Moreover, no significant difference was discerned about the relationship between abnormal sperm production and/or function (males: 33.64%; females: 83.05%), or blocked fallopian tube (males: 80.73%; females: 89.83%), environmental factors (males: 73.15%; females: 81.03%) and psychological stress between males and females (males: 39.81%; females: 38.98%; $p>0.05$). Females were more aware about the negative effects of sexually transmitted diseases on men's (males: 39.25%; females: 48.28%) and women's (males: 36.45%; females: 62.71%) fertility. In regard to female sexually transmitted infection (STI), the difference was significant ($p=0.000$).

52.78% of males and 64.29% of females knew that infertility is not 100% curable. Preservation of fertility was important for a high number of males and females (males: 94.39%; females: 88.14%). Females were slightly more concerned about their ability to have children (males: 42.86%; females: 57.63%), and women also said that if they found out that they were infertile, they would be upset, significantly more than males (males: 76.64%; females: 87.93%; $p=0.012$). A high percentage of male and females said that they would be ashamed to ask questions about infertility (males: 64.81%; females: 69.49%). 95.37% of males and 89.83% of females would have liked to have had more knowledge about fertility preservation and infertility risk factors. 68.18% of male and 86.64% of female students

preferred to consult a gynecologist for the initial treatment of infertility if they had a problem in conceiving a baby.

Most of the students (males: 38.88%; females: 25%) stated that they have received their knowledge about infertility through the Internet and then friends (23.14%), books (16.66%), family (14.81%), university (6.47%) and media (5.54%) in male students. For females, other preferred sources were family and media (19.44% and 19.44%), book and friends (13.8% and 13.8%) and the university (8.28%). 54.8% of male and 52.54% of female students suggested that courses or seminars about infertility and its causes are the best way for receiving knowledge, following by other methods, such as media and the Internet.

Determining students' knowledge, attitudes and beliefs about infertility contributes strongly to the design of educational programs associated with prevention of infertility, and also is highly beneficial to students' successful childbearing and quality of life. According to the current study, 65.14% of students knew the description of infertility, which is less than the results from the Quach et al. study (79.48%) (7); but their overall knowledge about the most fertile time in a woman's menstrual cycle was low (27.02%). 67.86% of female students did not know the most fertile time in a woman's menstrual cycle, which shows that female students are not sufficiently aware about the best time for intercourse in order to become pregnant. In a study by

Rouchou and Forde (8), students were more aware about the most fertile time in a women's menstrual cycle (43.7%), in comparison to our results (27.02%) (8). 60.2% of their participants knew the age of highest fertility potential in women.

Overall 32% of students were aware about the age range of females in which fertility decreased but in another study the awareness of students about this subject was 11.9% (8). In our study, 59.6% of students knew that infertility is a disease, but in a study in Pakistan, 43.5% of the participants had the opinion that infertility is not a disease (9). Rouchou and Forde (8) found that only 6% of students know that infertility is a disease. The awareness of male students about the negative effect of advanced age on men's fertility was significantly higher than that of females. The low knowledge about this factor may be related to the misconception that age does not affect fertility in men.

The majority of students (94.74%) knew that both men and women could be responsible for infertility, which is consistent with the results of Rouchou and Forde (87.5%) (8) and the Quach et al. study (80%) (7). Ali et al. showed that only 50% of people correctly identified that both male and female are equally responsible for infertility and in the event of infertility, both should be examined (9). The difference between results may be due to different populations selected for study. Similar to our study, the Rouchou and Forde and Quach et al. studies (7-8) were of students, but in Ali's study the population was people, not students. Therefore, it seems that students have higher knowledge or less prejudice about which partner is responsible for infertility.

Female students were significantly more aware about the relationship between men's and women's genetics and infertility; but a study found no significant change regarding this awareness between males and females (8). Females were significantly more aware about the relationship between men's and women's genital tract infections and infertility. The overall awareness of students about men's and women's genital tract infection (63%) was similar to that of the Rouchou and Forde study (59%) (8). The overall awareness of male students about the relationship between irregular menstrual cycle and infertility was 51.77%, and female awareness was significantly higher than that of males. In a study, the awareness of males was higher than in our study (58% vs. 34%), and there was no significant difference between male and females (8). Ali et al. showed that this awareness was 85% among the population they chose, which is higher than our results (9). Women were significantly more aware about the negative effects of underweight or overweight in women, which may be associated with their higher sensitivity to being balanced. About 80% of males were unaware about the negative effects of underweight or overweight on fertility in men and women. In the Quach et al. study, the awareness of male and female students about the negative effects of being underweight or overweight on fertility showed no significant difference (7).

Females were significantly more aware of the negative effects of alcohol consumption by men on fertility, but in a study by Rouchou and Forde there was no significant difference between females and males regarding their awareness about the negative effects of alcohol consumption on fertility (8). Females were significantly more aware about

secondary infertility, but in the Rouchou and Forde study there was no significant difference regarding secondary infertility (8). The awareness of students about the negative effects of smoking on women's fertility (48.33%) was more than that of men's (33.77%). This suggests that there is a perception among Iranian students that women are more susceptible to infertility than men. Despite the high amount of information through social media about the negative effects of smoking, students' awareness is low, and it shows the inadequacy of students' knowledge about such an important factor that directly affects fertility.

More than 80% of students of our study were aware that abnormal sperm production and/or function and blocked fallopian tube lead to infertility. A similar finding was achieved in a study by Rouchou and Forde (8), but the awareness of our students about the effect of environmental factors on fertility was more than that in the Rouchou and Forde study (77% vs. 60%) (6). A study showed that Iranian college students do not have high awareness about the effect of environmental factors on fertility, and women's awareness was higher than men's (3). 60% of students had no knowledge about the negative effects of psychological stress on men's and women's fertility, and no difference was observed between male and female students, but in a study on Iranian students, female students had significantly more awareness about the negative effects of stress on fertility (3). Similar to other studies (7-8), almost half of the students in the present study did not know that STI could cause infertility in men. Female awareness about the effects of STI on women's fertility was significantly higher than that of males. 58.5% of students knew that infertility is not 100% curable, which is higher than the results of Quach et al. study (40%) (7). 91.25% of students expressed that preservation of fertility was important to them. In the study by Quach et al. this percentage was lower, 69.7% (7).

Females were more concerned about their ability to have children and significantly more upset if they found out that they are infertile, consistent with the results of the Quach et al. study (7). 67% of students expressed that they are ashamed to ask questions about infertility, but in the Quach study this was about 7% (7). This may be associated with a difference in cultural and social features.

77.41% of students preferred to initially consult a gynecologist for the treatment of infertility, which is similar to the result of Ali et al. study (72%) (9). Results demonstrated that students receive their knowledge about infertility mostly through the Internet and most of them suggested that having courses or seminars about infertility and its causes is the best way to receive knowledge, which emphasizes the need to have university courses related to this topic. Our study demonstrated that there are gender-based differences in students' knowledge, attitudes and beliefs. This may be related to the perception among Iranian students that women are more susceptible to infertility than men.

Our results also revealed that the majority of students knew about some of the biological and lifestyle factors related to fertility, including that infertility is a problem for both men and women, the effects of genetics, abnormal sperm production and/or function, blocked fallopian tube and environmental factors. However, in some cases there are notable gaps in knowledge about fertility, such as the most

fertile time in a women's menstrual cycle, the age range with a marked decrease in a woman's ability to become pregnant, and negative effects of a range of factors, including advanced age on men's fertility, negative effects of genital tract infection, underweight or overweight, smoking, alcohol, psychological stress and sexually transmitted infection. The gaps in the knowledge of youth about infertility is also demonstrated in other studies (5-8, 25). Lack of adequate knowledge about prevention of infertility and reasons for infertility renders university students unable to adequately protect their fertility.

Consequently, university students must be educated about infertility, thereby empowering their awareness about protecting their fertility. Doing so would be helpful to society, because most are young people in their childbearing years, who would transfer their knowledge to others. It would be beneficial to have a teaching module inserted into universities' educational curricula that specifically addresses the topic of infertility. Effective education on infertility prevention can be accomplished through the media, schools, health care workers and government.

The findings of this study could form the basis of further training for public health educators, health care professionals and government policymakers to manage educational programs and for investigators to design new strategies regarding fertility protection into future studies. These educational opportunities would not only increase the knowledge and awareness of people, but would also decrease the stigma attached to childlessness.

4 Limitations

One of the limitations of the study is the generalizability of the results. Our participants were from one university. Therefore, the findings from this study cannot be used to provide an overall assessment of knowledge, attitudes and beliefs about infertility of all university-aged students in Iran. It would be very illuminating to conduct similar surveys among other Iranian universities to perform comparisons among them in order to determine this issue exactly, compare the results and enable educators to tailor appropriate education programs.

Another limitation of this study is that due to the nature of some of the questions in the questionnaire, some students who were unsure of the answers may have been persuaded to choose the right answer rather than their actual choice. For cultural and ethical reasons, we did not add questions about the participants' sexual behavior, but these questions are useful to determine the relationship between sexual behavior and infertility knowledge and attitudes. Designing questions about pregnancy and childbearing could have provided additional information about participants' knowledge about reproductive health, but because of time limitations we limited the number and types of questions to those related to infertility knowledge. Consequently, additional research needs to be conducted among this population using more focused and personalized studies. For example, this study found that there is still a widespread belief that women are more likely to become infertile due to any number of causes that are of equal risk to men and women.

4 Conclusion

It is essential to manage educational programs and design new strategies regarding fertility protection in universities.

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Ethical issue

Authors are aware of, and have complied with the best practice in publication ethics specifically with regard to authorship, dual submission, and manipulation of figures, competing interests and compliance with policies on research ethics. Authors have adhered to publication requirements that this submitted work is original and has not been published elsewhere in any form of language.

Competing interests

The authors wish to declare that there is no conflict of interest in this research work.

Authors' contribution

All the authors of this study have completely contributed to the data collection, data analyses and manuscript writing.

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