Black Sea Journal of Health Science
doi: 10.19127/bshealthscience.1595087

Open Access Journal
e-ISSN: 2619 – 9041

Research Article
Volume 8 - Issue 3: 91-96/ May 2025

ASSESSMENT OF KNOWLEDGE, ATTITUDES, AND PRACTICES REGARDING INFERTILITY AND ASSISTED REPRODUCTIVE TECHNOLOGIES AMONG UNIVERSITY STUDENTS IN HEALTH SCIENCES

Tiinçe AKSAK[1]*

[1]*Toros University, Vocational School of Health Services, Department of Medıcal Services and Techniques, 33140, Mersin, Türkiye*

Abstract: This study aimed to evaluate the knowledge, attitudes, and behaviors of university students in healthcare fields regarding infertility and assisted reproductive technologies (ART), as well as to examine the impact of demographic factors on these attitudes. This descriptive survey was conducted at Toros University Faculty of Health Sciences and Vocational School of Health Services in Mersin, Türkiye. A sample of 469 participants completed a 24-item questionnaire covering demographic information, infertility knowledge, ART-related attitudes, and opinions on gamete donation. Data were analyzed using SPSS 27 software to identify relationships between demographic variables and attitudes toward infertility. Most participants were familiar with infertility but lacked detailed knowledge of its causes. Similarly, attitudes toward in vitro fertilization (IVF) were generally positive, but misconceptions about the legitimacy of IVF-conceived children were identified. Female students scored significantly higher on infertility attitude scales than male students ($P<0.001$). Awareness of gamete donation and related legal frameworks was notably low. However, attitudes toward gamete donation were found to correlate with general infertility attitudes ($P=0.045$). No significant differences were observed in infertility attitude scores between students familiar with the concept of gamete donation and those not ($P=0.535$). A substantial proportion of participants (74.9%) desired seminars on infertility and ART to be organized at universities, highlighting the demand for further educational efforts. The findings highlight the need to update educational curricula in health sciences to address knowledge gaps in infertility and ART. Incorporating ethical, legal, and psychosocial dimensions into training programs would better prepare students to support infertile individuals effectively. Further studies involving more diverse demographic groups could also inform targeted interventions to address these gaps.

Keywords: Infertility, Awareness, Knowledge, University students, Health science

***Corresponding author:** Toros University, Vocational School of Health Services, Department of Medıcal Services and Techniques, 33140, Mersin, Türkiye
E mail: tiince.aksak@toros.edu.tr (T. AKSAK)
Tiinçe AKSAK https://orcid.org/0000-0001-7841-8456

Received: December 03, 2024
Accepted: January 15, 2025
Published: May 15, 2025

Cite as: Aksak T. 2025. Assessment of knowledge, attitudes, and practices regarding infertility and assisted reproductive technologies among university students in health sciences. BSJ Health Sci, 8(3): 91-96.

1. Introduction

Infertility, as defined by the World Health Organization (WHO), refers to the inability to conceive despite regular, unprotected sexual intercourse for one year in women under 35 years of age or for six months in women over 35. According to WHO data, infertility affects millions of individuals worldwide, negatively impacting the lives of one in every six people of reproductive age. In women, infertility may arise from abnormalities in reproductive organs such as the ovaries, uterus, or fallopian tubes, as well as endocrine system disorders or advanced age (Fritz and Jindal, 2018). In men, infertility is often associated with difficulties in semen ejaculation, insufficient sperm count, or abnormalities in sperm morphology and motility. While infertility may result from male or female factors, it can also occur due to unexplained causes. Infertility treatment is often achieved through assisted reproductive technologies (ART). Psychological distress among individuals and couples unable to fulfill their desire for parenthood due to infertility continues to increase. Like fertile individuals, those experiencing infertility have the right to decide on the number, timing, and spacing of their children. To address this, techniques such as intrauterine insemination (IUI), in vitro fertilization (IVF), and intracytoplasmic sperm injection (ICSI) have been developed (WHO, 2024).

Infertility is a sensitive condition requiring the support, guidance, and empathetic approach of healthcare professionals with adequate awareness and knowledge. This issue impacts individuals desire to become parents and directly affects their quality of life and psychosocial well-being (Cousineau and Domar, 2007). Prejudices and stigmatization surrounding infertility in society can further influence the psychological and social conditions of individuals dealing with this challenge. Studies have emphasized how healthcare professionals address these biases, establish effective patient communication, and

provide support (Hammarberg and Taylor, 2019). From the initiation to the process's conclusion healthcare workers and allied health professionals play critical roles. Positive attitudes stemming from the knowledge of healthcare professionals can alleviate the physiological, emotional, psychological, sexual, and social adversities faced by infertile couples (Pedro et al., 2018; Dönmez and Güner, 2021). Gamete donation, a significant method in infertility treatment, is a subject of considerable societal and ethical variability (Ezeome, 2022; Nogueira et al., 2023). Healthcare professionals must know about gamete donation and the relevant legal frameworks in their respective countries. Understanding the relationship between gamete donation and infertility is particularly important for healthcare workers specializing in this field. Individuals with insufficient awareness of fertility and infertility may lack accurate knowledge about reproductive age, causes of infertility, and available treatments. This knowledge gap can hinder their ability to make informed decisions in their own lives and to provide accurate guidance to others. For this reason, raising awareness, knowledge, and attitudes regarding fertility and infertility among university students in health-related fields critical. This awareness influences their future fertility decisions and prepares them to guide infertile couples effectively in their professional roles as healthcare providers (Chawłowska et al., 2020; Okine et al., 2023).

Infertility significantly impacts both individuals' psychosocial well-being and the quality of care provided by healthcare professionals. Investigating the attitudes of students in health-related fields toward infertility can influence the approaches they will adopt in their future professional practice. While extensive international research examines infertility awareness among university students, no studies have comprehensively assessed university students' understanding, knowledge, attitudes, and behaviors in health-related disciplines regarding infertility and assisted reproductive technologies. This study aims to evaluate the attitudes and behaviors of health science students toward infertility. Specifically, it seeks to understand their awareness, sensitivity, and knowledge levels regarding infertility and to examine how demographic variables, such as gender and perspectives on gamete donation, influence these attitudes. Furthermore, this study will analyze the relationship between student' attitudes toward infertility and demographic factors using a scale to measure infertility-related attitudes. By doing so, it aims to provide valuable insights into the factors shaping future healthcare professionals approaches to infertility and their ability to address the needs of infertile individuals effectively.

2. Materials and Methods

This descriptive survey is conducted to evaluate students' knowledge, attitudes, and behaviors regarding infertility and assisted reproductive technologies at the Faculty of Health Sciences and the Vocational School of Health Services at Toros University in Mersin, Türkiye. The study population consisted of 1,900 students, and a sample size of 409 participants was determined using a power analysis with a 99% confidence interval and a 0.05 alpha level. The research was carried out following approval from the Toros University Faculty of Health Sciences Non-Interventional Clinical Research Ethics Committee (approval date: September 27, 2024, protocol code: 14). Participants were informed about the purpose of the study, and the data collection process commenced after obtaining signed informed consent forms. Inclusion criteria were being between 18 and 40 and being enrolled in the Faculty of Health Sciences or the Vocational School of Health Services at Toros University. Exclusion criteria included being under 18 years old or having health conditions that could prevent participation in the study. The study's dependent variables were students' knowledge, attitudes, and behaviors related to infertility and assisted reproductive technologies. Independent variables included demographic characteristics.

The data were collected using a 24- item questionnaire adapted from validated scales and surveys in the literature. Permissions to use the Likert scale and the questionnaire items were obtained via email from the respective researchers (Siyez et al., 2018; Arhin et al., 2022). The questionnaire included five sections: the first five questions focused on demographic information, questions 6–8 assessed knowledge about infertility, question 9 evaluated empathy and attitudes toward infertile couples, questions 10–19 explored knowledge and attitudes regarding assisted reproductive technologies, questions 20–23 examined opinions on gamete donation, and question 24 addressed participants' interest in attending a related seminar. The Likert scale used in the study consisted of 12 subcategories, each scored on a scale from 1 to 5. Eight of these subcategories were evaluated positively, while four (3rd, 4th, 7th, and 10th) were scored negatively. The total scale score was compared with participants' demographic characteristics to identify patterns or associations.

Data analysis was performed using IBM SPSS Statistics version 27. The normality of the data distribution was assessed with the Shapiro-Wilk test. Differences between the two groups were analyzed using the independent samples t-test for normally distributed data and the Mann-Whitney U test for non-normally distributed data (Önder, 2018).

3. Results

A total of 469 volunteers participated in the study. Among those who responded to the age question, 429 participants reported being 18–25 years, 15 were in the 26–35 age range, and five were between 36–40 years (Table 1). Participants included students from the Faculty of Health Sciences and the Vocational School of Health Services. In total 202 students from the Faculty of Health Sciences and 262 from the Vocational School of Health Services indicated their respective departments. No significant

difference was observed comparing infertility attitude scale scores between these two groups (U=23605.5, P=0.915) (Table 2).

Table 1. Age distribution of participants

Age Range	N	%
18-25	429	95.5
26-35	15	3.34
36-40	5	1.11
Total	449	100.00

An overview of the age distribution of participants in the study. The 95% of participants fall within the 18-25 age range. 3.34% of participants are aged 26-35, while only 1.11% are in the 36-40 age range.

Table 2. Inter-unit evaluation of infertility attitude

Test	U Statistic	P Value
Mann-Whitney U	23605.5	0.915

* The Mann-Whitney U test, showed no significant difference between the two units regarding infertility attitude scores (P=0.915).

When examining the effect of gender on infertility attitudes, significant differences were identified between groups. Of the 469 participants, 449 responded to the gender question; 74.83% were female and 23.39% were male. Before analysis, the Shapiro-Wilk test was conducted to assess normality. Results indicated that the male group significantly differed from normal distribution, whereas the female group did not. Consequently, the Mann-Whitney U test was used. The results demonstrated that male participants had substantially lower attitude scores compared to female participants (U=22210.0, P<0.001) (Table 3). The most students stated their marital status as single.

Table 3. Evaluation of infertility attitudes according to gender groups

Test	U Statistic	P Value
Mann-Whitney U	22210.0	<0.001

* Mann-Whitney U test shows a statistically significant difference in infertility attitude scores between gender groups (P<0.001).

Most participants were familiar with the term infertility and recognized that both male and female factors could cause it. However, they lacked detailed knowledge about its common causes (Table 4). Regarding in vitro fertilization (IVF), most respondents were familiar with the term and expressed positive attitudes toward the treatment. Nevertheless, a significant portion of students believed that children conceived via IVF were not legitimate though they felt such children should be socially accepted (Table 5).

When asked about potential issues associated with IVF treatment, 70% of participants identified implantation failure, 8.1% mentioned genetic anomalies in the child, 12.3% pointed to female reproductive problem, 4.6% cited male reproductive issues, and 4.8% noted neonatal death as potential complications.

Awareness of infertility and its common causes. Regarding infertility, 52.7% of participants reported familiarity, 39.0% acknowledged awareness but lacked detailed information, and 7.0% did not know the concept. Regarding familiarity with the common causes of infertility, 17.7% of participants had detailed knowledge, 53.7% had some awareness but lacked specifics, and 27.5% were unfamiliar.

In questions regarding gamete donation, it was observed that most students were familiar with the concept. However, no significant difference was found in infertility attitude scores between those who had heard of gamete donation and those who had not (U=22291.5, P=0.535) (Tables 6 and 7). Interestingly, when asked about their general perspective on gamete donation, only 151 out of 467 students responded. Among these, 94 provided positive responses, while 57 expressed opposing views. A comparison of infertility attitude scores between students with positive and negative opinions on gamete donation revealed a significant difference (U=2884.0, P=0.045) (Table 8). Additionally, when asked whether they were aware of the laws related to gamete donation, 91.81% of respondents answered no. Regarding whether infertility and assisted reproductive technologies seminars should be held at universities, 74.95% of students desired such symposia.

Participants' perceptions of in vitro fertilization (IVF) treatment and its societal acceptance 77.6% of participants believe that IVF treatment offers hope to couples facing infertility issues, with only 3.0% disagreeing and 19.0% uncertain. Of the question that IVF is not a natural process, 18.1% agreed, 45.8% disagreed, and 35.4% expressed uncertainty. 92.3% of participants feel that IVF should be accepted by society in Türkiye, 1.5% disagree and 5.8% are uncertain.

Table 4. Awareness of infertility

	Yes	Yes, but I don't have detailed information	No	Total
Have you heard of the concept of infertility?	247	183	33	463
Percentage (%)	52.7	39.0	7.0	98.7
Are you familiar with the common causes of infertility?	83	252	129	464
Percentage (%)	17.7	53.7	27.5	98.9

Table 5. Awareness of IVF

	Yes	No	Perhaps	Total
Do you think that in vitro fertilization treatment offers hope to couples experiencing infertility problems?	364	14	89	467
Percentage (%)	77.6	3.0	19.0	99.6
Do you think that IVF treatment is not a natural process?	85	215	166	466
Percentage (%)	18.1	45.8	35.4	99.4
Do you think that in vitro fertilization should be accepted by Turkish society?	433	7	27	467
Percentage (%)	92.3	1.5	5.8	99.5
Do you think babies born through in vitro fertilization are legitimate?	97	311	55	463
Percentage (%)	364	14	89	467

Table 6. Awareness and knowledge of gamete donation

	Yes	No	Total
Have you heard of the concept of gamete donation?	247	187	434
Percentage (%)	56.9	43.0	92.5
Do you know the laws regarding gamete donation in Türkiye?	38	426	464
Percentage (%)	8.1	90.8	98.9

Regarding the legitimacy of babies born through IVF, 67.2% of participants believe they are legitimate, with 31.1% expressing doubt and 1.7% disagreeing.

Awareness of gamete donation and knowledge of the related legal framework in Türkiye. Among participants, %56.9 reported awareness of the concept of gamete donation, while %43.0 were unaware. While %8.1 of the participants stated that they were informed about gamete donation laws in Türkiye, %90.8 were unaware.

Table 7. Relationship between the concept of gamete donation and infertility attitude

Test	U Statistic	P Value
Mann-Whitney U	22291.5	0.535

* Mann-Whitney U test, no significant difference was observed in infertility attitude scores of those who heard/did not hear about the concept of gamete donation (P=0.535).

Table 8. Relationship between general perspective on gamete donation and infertility attitude

Test	U Statistic	P Value
Mann-Whitney U	2884.0	0.045

* The Mann-Whitney U test showed that the general view of gamete donation showed a statistically significant difference in infertility attitude scores (P=0.045).

4. Discussion

In our study examining the knowledge, attitudes, and behaviors of university students in healthcare-related fields toward infertility and assisted reproductive technologies, it was observed that the majority of students were familiar with the concept of infertility but lacked detailed knowledge about its causes. This finding aligns with previous studies in the literature highlighting the knowledge gaps among university students regarding fertility (Lampic et al., 2006; Okine et al., 2023). The lack of adequate knowledge on this topic, particularly among students pursuing healthcare education, suggests the need for a review and potential revision of educational curricula.

Gender was found to have a significant influence on attitudes toward infertility; female students exhibited higher attitude scores compared to their male counterparts. This difference may be attributed to women's greater responsibility toward reproductive health and increased exposure to societal expectations related to these issues. Similarly, the literature indicates that women are generally more aware of fertility and parenting-related topics (Peterson et al., 2012; Meissner et al., 2016; Iktidar et al., 2022; Kizilkaya and Murat, 2022).

Since the majority of participants were aged between 18 and 25 years, the relationship between age and attitudes toward infertility could not be assessed. In the literature, a study focusing on students reported no significant differences in infertility knowledge levels across age groups (Daniluk and Koert, 2015). Similarly, our study found no significant differences between relationship status and attitudes toward infertility. Furthermore, no significant association existed between students' academic year and their infertility attitude scores. Contrastingly, another study emphasized a considerable difference between students' academic year, the presence of an infertile individual in the family, and infertility attitude scores (Dönmez and Güner, 2021).

No significant differences were observed in the attitudes and behaviors toward infertility and assisted reproductive technologies between vocational school and faculty students based on their institutional affiliation. No studies in the literature have specifically examined this topic at the institutional level, which highlights the need for further research to understand the impact of different levels of education in healthcare on students' knowledge, attitudes, and awareness of reproductive health. Comparative studies across academic institutions could

provide valuable insights for improving the content of future educational programs and enhancing individual awareness in this field.

The high level of awareness among students in the field of healthcare regarding assisted reproductive technologies reflects their interest in modern reproductive techniques. While children born through assisted reproductive technologies have long been accepted as legitimate in other societies (Arhin et al., 2022), persistent doubts about the legitimacy of children conceived through in vitro fertilization in this region highlight ongoing societal prejudices against these methods. This emphasizes the necessity of integrating practices aimed at enhancing ethical and social awareness into the education and training processes of healthcare professionals.

Additionally, the fact that most participants perceived implantation failure as the primary indication for in vitro fertilization treatment suggests a lack of comprehensive knowledge about other potential causes of infertility. This indicates a need for more robust educational efforts to address gaps in understanding the multifaceted nature of infertility and its management.

Moreover, it was observed that most students were unfamiliar with gamete donation and lacked knowledge about the relevant legal frameworks. Attitudes toward gamete donation were found to be associated with general attitudes toward infertility. Similarly, a study involving healthcare students reported that most participants were unaware of gamete donation procedures and legislation (Nogueira et al., 2023). These findings suggest that educational initiatives to increase awareness of gamete donation could contribute significantly to the overall understanding of infertility and the development of patient support programs.

A considerable proportion of participants expressed a desire for seminars on infertility and assisted reproductive technologies to be organized at universities, which reflects students' eagerness to acquire more knowledge on the subject and provides an opportunity to address existing gaps in educational programs.

The findings of this study highlight the importance of healthcare professionals' knowledge and attitudes toward infertility and assisted reproductive technologies, emphasizing the need for updated and enhanced educational content in this field. Future studies could aim to expand this knowledge by including diverse demographic groups, thereby providing a more comprehensive understanding of the topic.

5. Conclusion

The findings underscore the need to enhance educational curricula in health sciences to improve understanding of infertility and ART. Incorporating content on ethical, legal, and psychosocial aspects into training programs can better prepare future healthcare professionals to address infertility-related challenges. Further research is recommended to examine these topics across diverse demographic groups and educational levels, enabling targeted interventions to bridge knowledge gaps. This study includes only the students of the Vocational School of Health Services and the Faculty of Health Sciences. The absence of other health sciences departments at the university where the study was conducted has limited the expansion of the sampling range. This is considered a factor that restricts the generalizability of the findings within the context of the broader field of health sciences. It is recommended that future research include a more comprehensive sample covering various health-related departments.

This study contributes to understanding how educational initiatives can shape healthcare students' perceptions, fostering a more informed and empathetic approach to infertility in their professional practices.

Author Contributions

The percentages of the author' contributions are presented below. The author reviewed and approved the final version of the manuscript.

	T.A.
C	100
D	100
S	100
DCP	100
DAI	100
L	100
W	100
CR	100
SR	100
PM	100
FA	100

C= concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

Conflict of Interest

The author declared that there is no conflict of interest.

Ethical Consideration

This study was conducted with the approval of the Toros University Faculty of Health Sciences Non-Interventional Clinical Research Ethics Committee (approval date: September 27, 2024, protocol code: 14).

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