

*Review Article***Awareness and attitude of medical sciences students and related factors towards fertility: A narrative review**Tahereh Yaghoubi ^a  | Farideh Rezai Abhari ^b  | Fereshteh Araghian Mojarad ^{a*} 

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Abstract

Fertility, a fundamental physiological process for individuals and society, can be regarded as a prerequisite for any social-economic development. The purpose of the present study is to investigate the awareness and attitude of medical sciences students and related factors towards fertility. The current narrative review study was conducted based on the search of the PubMed, Scopus, Scientific Information Database, and Magiran and Google Scholar search engine within the time frame of 2000 to 2022, according to title, abstract, and keywords, using advanced search strategies and appropriate operators. The keywords for article extraction include reproductive, child-having, fertility, and childbearing. The inclusion criteria were full-text articles in Persian and English. The exclusion criteria were lack of access to the full text of the article, review articles and qualitative studies. After searching the databases, 788 studies were found, and after applying the inclusion and exclusion criteria and removing duplicates, 27 articles were included in the study. The results showed a positive attitude of students towards parenthood and childbearing. Women were more concerned than men about having a child while studying and its impact on their job market position. Half of the women intended to become pregnant after the age of 35. Most students had little knowledge about the decrease in fertility with increasing age, but women were more aware of the effect of age on fertility than men. The importance of parenthood was higher among non-medical students, especially younger ones. In sum, based on the findings, considering the low level of student's knowledge about the appropriate age and time for fertility in the menstrual cycle and the success rate of assisted reproductive techniques, it is necessary to take a step toward increasing students' fertility awareness by holding educational workshops and creating educational websites.

Keywords: Awareness, Attitude, Medical, Students, Fertility, Review.**1 | Introduction**

Fertility is a fundamental physiological process for individuals and society [1], and as a unique factor, increasing population and transforming the population's age structure are of particular importance. Additionally, optimal access to social indicators such as family, marriage, fertility, and economic indicators are all tied to the demographic situation [2]. Therefore, addressing the phenomenon of population and the tendency towards fertility is a prerequisite for any social-economic development in society [2].

According to the World Health Organization's definition of reproductive health, all people should be able to have a healthy

and satisfying sexual life and make free and responsible decisions about the timing and manner of their childbearing. They should also have access to information and safe, effective, and affordable methods for conscious and voluntary fertility regulation [3]. In this regard, fertility awareness is a tool that can help achieve desirable reproductive outcomes. Fertility awareness refers to methods used to determine the phases of fertility and infertility in a woman's menstrual cycle. These methods can be used to prevent pregnancy, achieve pregnancy, or monitor women's health. This awareness is a valuable tool that makes women and men aware of their health status [4, 5].

A global study of nearly 17,500 individuals from 10 countries in Europe, Africa, the Middle East, and South America showed that overall, the level of fertility awareness among both men and women is deficient, especially regarding the impact of age on fertility [6]. The results of other studies conducted in Sweden, Finland, Austria, China, and the United States are consistent with this finding [6-13]. Along with these global trends, the Islamic Republic of Iran has experienced extensive changes in its fertility rate, such that over the past three decades, Iran's fertility rate has significantly decreased [14]. The results of the census and statistics available in Iran show that the total fertility rate has decreased from about 7.7 children per woman in 1966 to 1.6 children per woman in 2011 [15]. These figures indicate that the country is experiencing fertility below the replacement level. This decline can pose threats in the coming years, such as a decrease in the active and productive population, an aging population, and social welfare issues resulting from the disruption of the age structure ratio. This threatens economic growth and social development, which require a young, active, and innovative workforce [16].

Studies have shown that various factors, such as social factors like educational advancement, finding suitable employment, economic stability, and medical factors such as access to various contraception and fertility treatments, were influential in delaying fertility [6-24]. In a qualitative study conducted in Iran in 2012, factors such as economic difficulties such as lack of stable housing and employment for spouses, social norms associated with appropriate marriage age, pursuing higher education, and uncertainty about marital stability due to increasing divorce rates in society, and increased access to contraceptive methods have been identified as important reasons for delayed childbearing [25]. Studies have also shown that among the influential factors, education significantly affects the increase in delayed fertility, so there is an inverse relationship between education and the age of first birth [20, 25-27]. Therefore, this study aims to assess the awareness and attitude of medical sciences students and related factors towards fertility.

2 | Methods

This narrative review searched the databases of PubMed, Scopus, Scientific Information Database, and Magiran and Google Scholar search engine within the time frame of 2000 to 2022. The search was conducted based on the title, abstract, and keywords, using advanced search strategies, operators, and appropriate tags for each scientific database. The keywords for article extraction include reproductive, child-having, fertility, and childbearing. The inclusion criteria were full-text articles in Persian and

English, while the exclusion criteria were the inability to access the full-text article and review articles. After searching the databases, 788 studies were found, and after applying the inclusion and exclusion criteria and removing duplicates, 27 articles were included in the study. The search process is illustrated in the following diagram.

3 | Results

The study's findings indicated that four of the 27 relevant articles were conducted in Iran. Also, the results showed students' positive attitude towards parenthood and having children, while women were more concerned about having children during their studies and its impact on their job opportunities. Half of the women intended to have children after the age of 35. Most students had little knowledge about the decline in fertility with age, but women were more aware of the impact of age on fertility than men. The importance of parenthood among non-medical students was higher than among medical students, especially younger ones (Table 1). Most students intend to have children at an age when fertility declines. Non-medical students, especially women, had more knowledge about fertility, and most students had little knowledge about the success rates of fertility treatments.

Overall, students had a positive attitude towards parenthood, but most had little knowledge about the age-related decline in fertility, and three-quarters believed that fertility treatments have very high success rates. Both male and female students wanted to have two children but had little knowledge about fertility. Male students stated that parenthood impacts their lives and careers less than female students.

The most critical factors to future parenthood were having a responsible and mature partner, a stable married life, and good economic conditions. Students' most important attitude regarding parenthood's impact on their lives was the formation of a stable and strong family, increased love and affection, and the creation of new interests in life.

4 | Discussion

This study was conducted to review articles related to students' awareness and attitudes regarding fertility. The findings indicated a positive attitude of students towards parenthood and having children. Women were more concerned than men about having children during their studies and its impact on their position in the job market. Further, half of the women intended to have children after the age 35. Most students had limited awareness regarding the decrease in fertility with age, but women were more aware than men about the effect of age on fertility. Becoming a parent

was more critical for non-medical students, especially younger ones. The most important attitude of male and female students towards the impact of parenthood on their lives was the formation of a real family, increased love and affection, the creation of new interests, and the strengthening of their lives, followed by the formation of new perspectives in life, personal evolution, and enjoyment of life. The least essential attitude was their concern about worse conditions in the job market, less freedom, weaker financial status, insufficient time for work and personal interests, and tension in marital relationships. The study conducted by Alfaraj *et al.*, in 2019 also showed that most students are concerned about having children but unaware of the consequences of decreased fertility due to age [28]. In a study conducted by Naghipour *et al.*, in 2021 to examine the attitudes toward having children among medical students and interns, the results showed that 79.9% of the students had a positive attitude toward having children. Physical, identity, cultural, social, economic, and religious factors also influence attitudes toward having children. The belief component was significantly more pronounced in male students than female

students, but other indicators did not differ. Also, in unmarried students, the economic component had a higher score than married students, while the belief component had a higher score than unmarried students. The belief component of having children was more pronounced in male students, possibly due to a lack of understanding of physiological changes during pregnancy [29].

Considering the increasing financial pressures during the marriage, the economic component has a deterrent effect on married individuals' willingness to have children. To increase the willingness to have children against economic pressures, it is necessary to increase the belief component of having children in students through macro-planning [29]. In a study conducted in Iran, the most important reasons for the desire to have children among individuals of childbearing age were interested in having a child, becoming a father/mother, and having a spouse at an appropriate age for fertility. The main reasons for the lack of desire to have children were concern about providing for the children's future, increasing economic problems with the birth of another/new child, and satisfaction with their current children [30].

Table 1. Characteristics of studies included in this narrative review.

Author/Year	Country	Sample size	Results
Lampic <i>et al.</i> , 2006 [6]	Sweden	222 Woman 179 men	Male and female students in Sweden had a largely positive attitude towards parenthood and having children, but women were significantly more concerned than men about the challenges of combining work and child-rearing. Additionally, about half of women intended to become pregnant after age 35. Both men and women had a very optimistic view of women's ability to conceive and were not aware of the decrease in fertility with increasing age.
Tydén <i>et al.</i> , 2006 [31]	Sweden	300 women	The students expressed a desire to have two to three children, with only 2.7% having no intention of having children. Additionally, most students considered the age of 29 as the ideal time for having their first child and 35 the ideal age for having their last child. Only 18% of women were concerned about fertility before reaching advanced age, and the students had a relatively good understanding of fertility.
Skoog Svanberg <i>et al.</i> , 2006 [32]	Sweden	141 women 116 men	Most students had a positive attitude towards having children but intended to become parents at an older age, after 35 years old. Women were also more concerned than men about having children while studying and the impact on their position in the job market. One-fourth of the students were unaware of the decline in female fertility power between the ages of 35-40. About half of them had a very positive view of the success of fertility treatments.
Virtala <i>et al.</i> , 2006 [8]	Finland	2009 woman 1126 men	More than 90% of students expressed a desire for parenthood in the future, even though they are currently at a suitable age for fertility. As a result, there will be an unintended risk of infertility among students.
Rovei <i>et al.</i> , 2010 [33]	Italy	607 women 351 men	The students recognized having children as an important part of their lives, but their knowledge about human fertility and legal regulations regarding fertility treatments was limited, regardless of gender or type of education.
Bretherick <i>et al.</i> , 2010 [34]	Canada	308 women	Although many students were aware that fertility declines with age, they significantly overestimated their chances of getting pregnant at all ages and were not aware of the steep decline in fertility power with increasing age.
Virtala <i>et al.</i> , 2011 [35]	Finland	3222 women 1846 men	8.25% of students had children, and 94.0% wanted to have children in the future. More than half of men and about one-third of women believed that a significant decline in female fertility begins after age 45. However, it should be noted that women were more aware than men of the impact of age on fertility.
Hashiloni-Dolev <i>et al.</i> , 2011 [13]	Israel	300 women 108 men	The students believed that female fertility power remains high throughout their lifetime, and they also overestimated the success rate of IVF treatment for women aged 40 and over. Only 11% of students knew that a woman in her mid-40s or older could only achieve pregnancy through frozen eggs and that her fertility power decreased significantly.
Peterson <i>et al.</i> , 2012 [7]	America	138 women 108 men	9 out of 10 people expressed a desire to have children in the future, and becoming a parent was seen as an essential aspect of their lives. The students also wanted their first and last child within

Author/Year	Country	Sample size	Results
			their fertility window. However, they were unaware of the decline in fertility power and the probability of pregnancy following unprotected intercourse with increasing age. They also significantly overestimated the success rate of IVF in treating infertility.
Chan <i>et al.</i> , 2015 [12]	China	275 women 92 men	The students were less interested in having children and less concerned about infertility after reading C. Lampic's study. A significant proportion of Chinese students (92%) underestimated the age-related decline in fertility and overestimated the success rate of infertility treatment (66%).
Nouri <i>et al.</i> , 2014 [9]	Austria	170 women 170 men	77% of students expressed a desire to have children in the future. Medical students planned to have fewer children and a longer delay before parenthood, but they had a higher awareness of the impact of age on fertility compared to non-medical students. Furthermore, most medical students had a more positive attitude towards fertility treatments in case of infertility than non-medical students. Medical students had a healthier lifestyle compared to non-medical students. Women had a higher rate of healthy living and fertility awareness.
Adesiyun <i>et al.</i> , 2014 [11]	Nigeria	107 women 199 men	Although the attitudes of medical and non-medical students towards parenthood were positive, they intended to have children at ages when fertility power decreases due to a lack of awareness.
Rouchou & Forde, 2015 [36]	Granada	312 women 163 men	The scientific knowledge of students regarding the causes of infertility is very low.
Lucas <i>et al.</i> , 2015 [37]	New Zealand	453 women 226 men	Students at the University of New Zealand also overestimated the fertility power of women and were unaware of the age-related decline in fertility.
Khalil <i>et al.</i> , 2015 [38]	Iraq	78 women 72 men	Parenthood is more important for non-medical students than medical students. Moreover, most medical students wanted fewer children than non-medical students. The desired age for having the first child was 25-29 years old for medical students and 24-24 years old for non-medical students. Most medical students considered the age of 30-39 years old for having their last child, while non-medical students considered the age of 40-44 years old. In the case of infertility, medical students tended to choose fertility treatments with the assumption of high success rates.
Sørensen <i>et al.</i> , 2016 [39]	Denmark	438 women 79 men	Although most students had a positive attitude towards parenthood, they wanted to become parents after reaching the biological age of fertility decline. This is a concerning level of fertility awareness among both genders in this study.
Mogilevkina <i>et al.</i> , 2016 [40]	Ukraine	858 women 408 men	One-quarter of the students were male, 16% of female students did not intend to have children, and 17% intended to have only one child. Women preferred to have their first child at the age of 24.4 years old, and men at the age of 26.8 years old. Approximately 60% of the students reported that female fertility declines after age 45.
Meissner <i>et al.</i> , 2016 [41]	Germany	881 women 263 men	Most of them plan to have children at ages when fertility power decreases. Non-medical students expressed a stronger desire for parenthood at younger ages than medical students and female medical students had higher fertility awareness. Additionally, students' awareness regarding the success rates of fertility treatments was low.
Abiodun <i>et al.</i> , 2016 [10]	Nigeria	231 women 158 men	Students' attitude regarding parenthood was positive, but most had little awareness about the age-related decline in fertility power, and three-quarters of them overestimated the success rates of fertility treatments.
Vujčić <i>et al.</i> , 2017 [42]	Serbia	271 women 147 men	Students have a positive attitude towards parenthood but insufficient awareness regarding the age-related decline in fertility power.
Hamedani & Ahmadi, 2021 [43]	Iran	401 students of different fields and degrees	The level of awareness was good (score higher than 75%) in 8.36% of the participants, moderate (score between 25% to 75%) in 9.60% of them, and poor (score lower than 25%) in 2% of them.
Naghipour <i>et al.</i> , 2021 [29]	Iran	140 students	In the analysis of the variable of childbearing, 9.79% of individuals had a positive attitude, and 1.20% had a negative attitude toward childbearing. A belief factor can increase the inclination towards childbearing in the face of economic pressures.
Zarei Salehabadi <i>et al.</i> , 2020 [44]	Iran	80 pregnant women	The mean attitude scores towards fertility and childbearing did not differ between the control group before and after the intervention and the control and intervention group before the intervention. However, there was a statistically significant difference in the attitude scores between the intervention group before and after the intervention. After the intervention, the mean attitude score of the intervention group was significantly higher than that of the control group. Empowerment programs to increase awareness, motivation, self-esteem, self-control, preventive behaviors, and improving attitudes towards fertility and childbearing among women with a history of unsuccessful pregnancy can be effective.
Alfaraj <i>et al.</i> , 2019 [28]	Arabia	248 girls	Nearly 80% of female undergraduate students expressed the desire to have children. On the other hand, 85% of respondents suggested planning to delay childbearing until the end of their studies and having a stable job. This study showed that most students are concerned about becoming parents. However, participants were unaware of the decrease in fertility due to age.
Abimbola Oke, 2019 [45]	Nigeria	167 men and 244 women	Female students tended to start and finish childbearing earlier than males. Only 18.3% of male and 21.5% of female students correctly identified that women's fertility significantly decreases

Author/Year	Country	Sample size	Results
			by age 35. Males significantly overestimated the fertility of women over 35 years old. Almost half of women (46.5%) intended to have a child after age 35, but 42.9% overestimated the likelihood of pregnancy over 35 years old. Continuing childbearing at older ages based on incorrect perceptions of age-related fertility decline can lead to unintended infertility among individuals who value childbearing.
Chawłowska <i>et al.</i> , 2020 [46]	Poland	456 women aged 18 to 29	The relationship between students' knowledge and age, year of study, university, and information sources had a mean score of 55.8% correct answers. Older medical students were the most knowledgeable, with 93.4% of respondents correctly identifying the optimal age for a woman to have her first child. More than 90% of respondents believed that the risks of jeopardizing fertility, such as smoking, diseases, and psychological discomfort, existed. However, awareness of the adverse effects of an imbalanced diet, irregular sleep, and long-term physical exertion was much weaker, with only 47.1% of students reporting awareness.
Shin <i>et al.</i> , 2020 [47]	South Korea	166 male and female undergraduate students	Both male and female students wanted two children but were unaware of their fertility. Male students expressed that becoming parentless influenced their lives and careers more than female students.

4.1 | Limitations

This narrative review encountered several limitations during its course. While we made extensive efforts in our search, there remains a possibility that some pertinent studies in this area were not included in our review. Additionally, our review was limited to studies published in English and Persian languages, which could have excluded relevant research in other languages from our analysis.

4.2 | Clinical implications for health managers and policymakers

As a recommendation, health policymakers can take steps toward increasing students' fertility awareness by holding workshops and creating educational websites in Persian. Today, national policies emphasize encouraging and promoting parenthood more than ever because fertility in society has decreased. Considering that starting parenthood has a direct relationship with overall fertility, it is crucial to emphasize the importance of fertility awareness in managing fertility and, consequently, the age of starting parenthood.

4.3 | Recommendations for future research

It is suggested that in order to increase the positive attitude towards childbearing among students, qualitative studies should be conducted to determine the hidden factors affecting ethnic, cultural, and religious childbearing.

5 | Conclusions

Therefore, policymakers in the health system should use the findings of this study to prioritize the needs of society and increase fertility awareness among students and the younger generation to prevent increased age of pregnancy, maternal and fetal consequences, the use of invasive fertility methods, and ultimately a decrease in the fertility rate of the community. Finally, it is

recommended to conduct qualitative research to increase the positive attitudes toward having children among students and identify the underlying factors related to ethnic, cultural, and religious factors.

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Authors' contributions

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work: TY, FRA, FAM; Drafting the work or revising it critically for important intellectual content: TY, FRA, FAM; Final approval of the version to be published: TY, FRA, FAM; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: TY, FRA, FAM.

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We do not have potential conflicts of interest with respect to the research, authorship, and publication of this article.

Availability of data and materials

The datasets used during the current study are available from the corresponding author on request.

Using artificial intelligent chatbots

None.

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