BMC Public Health

RESEARCH

Open Access

Fertility knowledge, desire, and associated factors among Iranian couples: a cross-sectional study in Northwest Iran

Sepideh Mashayekh-Amiri[1], Behnam Molaie[2], Fatemeh Aliasghari[3], Fatemeh Rashidi[4], Elnaz Hemati[5] and Mojgan Mirghafourvand[6*]

Abstract

Background Childbearing is a cornerstone of sustainable development in both developed and developing countries, including Iran. The present study was conducted to determine the fertility Knowledge, desire and associated factors among Iranian couples in the northwest of Iran.

Methods This cross-sectional study is the first phase (quantitative phase) of a sequential explanatory mixed-methods research, which was conducted on 1,834 Iranian couples. The socio-demographic checklist, the Male and Female Fertility Knowledge Inventories (MFKI and FFKI), and the Fertility Desire Scale (FDS) were utilized for data collection. To examine the factors associated with the level of fertility knowledge and desire, an independent t-test or one-way ANOVA was used in bivariate analyses and the general linear model (GLM) was employed in multivariate analyses.

Results According to the GLM, women under 30 years of age, with less than five years of marriage, holding a high school diploma or below, and those who were homemakers had significantly lower fertility knowledge scores compared to women aged 30 or above, with five or more years of marriage, higher education, and employee. Among men, those with a high school diploma or below and those dissatisfied with their marital life also showed significantly lower fertility knowledge scores compared to men with higher education and those satisfied with their marriages. Furthermore, both women and men who married before the age of 30 and those dissatisfied with their marital life had significantly lower fertility desire scores compared to their counterparts who married at or after 30 and reported marital satisfaction. Women and men with less than five years of marriage, women with a high school diploma, men with less than a high school diploma, and those with inadequate or relatively inadequate income showed significantly higher fertility desire scores compared to those with five or more years of marriage, university education, and completely adequate income.

Conclusions The findings of this study showed that the fertility knowledge and desire among Iranian couples were linked to their demographic and social characteristics.

*Correspondence:
Mojgan Mirghafourvand
mirghafourvand@gmail.com

Full list of author information is available at the end of the article

Plain language summary

Childbearing is a significant phenomenon in demographic movements. Given the crucial role of intrinsic factors such as knowledge and desire regarding childbearing, identifying the associated factors provides a valuable foundation for designing interventions to improve the current situation. This cross-sectional study was conducted to determine the fertility Knowledge and desire of Iranian couples and to identify the factors associated with it in the northwest of Iran (health centers in Tabriz, Urmia, and Ardabil). A sample size of 1834 Iranian couples (917 women and their 917 spouses) was used to determine the factors associated with fertility knowledge and desire. The required data was collected by distributing socio-demographic checklist, the Male and Female Fertility Knowledge Inventories (MFKI and FFKI), and the Fertility Desire Scale (FDS). A generalized linear model (GLM) was used to determine the factors associated with fertility knowledge and desire. The findings of the present study indicated that factors such as age, duration of marriage, education level, and occupation are related to women's knowledge. Additionally, factors such as education level and marital satisfaction have a significant relationship with men's knowledge. The fertility desire among Iranian couples is also associated with factors such as age at marriage, duration of marriage, education level, marital satisfaction, and income level. Given that infertility and reluctance toward childbearing remain global public health concerns, imposing high costs on healthcare systems and individuals, it seems that identifying underlying factors—such as couples' knowledge and desire for childbearing—and recognizing associated factors influences could assist policymakers.

Keywords Childbearing, Fertility awareness, Fertility desire, Cross-sectional study, Population growth, Iranian couples

Background

Fertility is considered one of the most important components of population dynamics, playing a major role in a country's population's quantitative and qualitative evolution [1]. "Improving reproductive health and reproductive rights through universal access to sexual and reproductive healthcare services." is a crucial goal of the Millennium Development Goals (MDGs) and sustainable development Goals (SDGs) [2]. Despite significant global progress in securing sexual and reproductive rights toward achieving this goal, shifting gender norms and economic insecurity have led to delays in childbearing, which has become a global challenge [3].

In this regard, the results of a study published in "The Lancet" (2024), found that the global Total Fertility Rate (TFR) decreased by more than half, from 4.84 in 1950 to 2.23 in 2021. Furthermore, there were 129 million live births globally in 2021 compared to 142 million in 2016. According to the model, the worldwide TFR would keep declining, hitting 1.83 by 2050 and 1.59 by 2100. These results show a significant decrease in fertility rates worldwide, with over half of the countries experiencing fertility levels below replacement levels [4].

The Islamic Republic of Iran, a West Asian country with a population of 88 million, is well-known for experiencing one of the most dramatic fertility reductions in human history [5]. According to the study above, Iran's TFR in 1950, 1980, 2021, 2050, and 2100 was 6.21, 7.41, 1.52, 1.31, and 1.28, respectively, demonstrating a declining and worrying trend in TFR in the following years [4]. Furthermore, Iran's general population growth rate has dramatically slowed. According to the World Bank report, Iran's population increased by 1.23% from 2015 to 2019, 1.13% from 2020 to 2024, and is anticipated to fall below 1% after 2025 [6]. This shift from natural to managed reproduction, combined with lower death rates and relatively high levels of young migration, may eventually accelerate the rate and scale of Iran's population aging [7].

As a result, a wide range of negative consequences threatens the country, including population aging, a lack or reduction in economic growth and development, social harms, communication problems between children and smaller families, mental health issues in future generations, the high costs of elderly care, weakening national defense forces, a decline in the young and talented workforce, and even the potential extinction of the human population in the future [8].

Fertility can be examined as a social reality at both macro and micro levels. The macro level involves the impact of environmental, social, political, and cultural factors on fertility. On the other hand, the micro level consists of the influence of internal factors such as knowledge, desires, and personal attitudes toward fertility behavior [5]. According to previous studies, the most significant internal factors affecting fertility are knowledge and desire for childbearing, which determine the ideals, preferences, and fertility behaviors of couples [6]. One of the main factors contributing to delayed childbearing and the increased incidence of infertility is a lack of knowledge regarding fertility potential. Currently, fertility knowledge is low worldwide [9].

Fertility knowledge, as an inseparable aspect of preventive healthcare, is defined by the International Glossary on Infertility and Fertility Care as understanding reproduction, fecundity, fecundability, individual risk factors (such as age, sexual health issues like sexually transmitted infection (STI), and lifestyle factors like smoking and

obesity), and non-individual risk factors (such as environmental and workplace factors), including awareness of the social and cultural factors that affect family planning and family formation needs [10]. In this context, the results of the study by Mohammadi et al. (2023) on identifying factors related to fertility knowledge among 1,200 married Iranian men and women showed that fertility knowledge was significantly associated with being female, higher economic status, a desire for future childbearing, and a willingness to increase fertility knowledge [11].

The second internal factor influencing fertility is the fertility desire. Desire for childbearing is a psychological state in which an individual has a personal motivation to have children. Couples with a stronger motivation to have children in the future have a higher fertility desire [12]. The results of studies show that socio-demographic factors such as income [13], marital satisfaction [14], duration of marriage [15], and level of education [16] are related to couples' desire for fertility. However, the relationship between these factors and the fertility knowledge and desire is not well understood. The results of the systematic review by Mahbobe et al. (2024) on identifying factors associated with the desire for childbearing categorized the related factors into three groups: demographic factors (such as gender, age, age at marriage, education, race, and place of residence), social and environmental factors (such as religion, technological advancements, life experiences, culture, political climate, family structure, economic issues, and media access), and psychological-physical factors (such as self-esteem, personality, depression, underlying health conditions, and fertility and infertility history) [16]. Also, the results of a study by Kumar Saya et al. (2021) on current fertility desire and its associated factors among 2228 Indian couples showed that age, socio-economic status, marital satisfaction, education of the women, family type, religion, number of living children were significantly associated with fertility desire in univariate analysis [17].

The current global fertility patterns reveal a decline in fertility rates, deteriorating reproductive health indicators over the past 5 to 6 decades across various regions, increased utilization of contraception methods, and a reduction in maternal and child mortality. This context creates an opportunity for a comprehensive agenda focused on reproductive care. However, the implementation of any fertility program requires consideration of knowledge, the desire of couples, and addressing behavioral barriers to increase fertility [18]. Many studies have been conducted to assess fertility knowledge and desire worldwide, but none have examined these two variables simultaneously. Additionally, studies in the target group of couples are limited. As a result, we aimed to conduct this study to assess the fertility knowledge and desire of Iranian couples and identify the factors related to them in the northwest region of Iran.

Methods

Study design

This cross-sectional study is based on the first phase (quantitative phase) of a sequential explanatory mixed method. This study aimed to determine Iranian couples' reproductive knowledge, desire, and related factors. The study was conducted on 1,834 Iranian couples (917 women and their 917 spouses) residing in the northwest region of Iran (health centers in Tabriz, Urmia, and Ardabil). A cluster random sampling method was used, following ethical approval from the Ethics Committee of Tabriz University of Medical Sciences (Ethical approval code: IR.TBZMED.REC.1401.211), and the study was carried out between January 2023 and September 2023.

Participants and data collection

The inclusion criteria for the study were as follows: married women and men residing in the northwest region of Iran, within the reproductive age range (women aged 18–49 years and men aged 18–59 years), no history of primary infertility, women and men who had been married for more than one year and did not have children, and women and men whose last child had been born more than three years ago. Couples with more than one child, widowed or divorced men and women, individuals with a history of mental illness, those taking antidepressant medications (tricyclic antidepressants such as amitriptyline, clomipramine, dosulpine, doxepin, imipramine, lofepramine, nortriptyline, trazodone; serotonin reuptake inhibitors such as citalopram, fluoxetine, paroxetine, sertraline; monoamine oxidase inhibitors such as phenelzine, tranylcypromine; serotonin-norepinephrine reuptake inhibitors such as reboxetine, venlafaxine), individuals who had experienced a stressful event (such as divorce, death of a close family member, or a diagnosis of an incurable or hard-to-treat illness for a family member within the past three months), and those with specific or chronic illnesses (such as cancer, heart disease, kidney disease, etc.) were excluded from the study.

For the sampling process, data was collected from three provincial centers in East Azerbaijan (Tabriz), West Azerbaijan (Urmia), and Ardabil (Ardabil). A cluster random sampling method was used in each province. First, one-quarter of the health centers were randomly selected using the website www.random.org. After visiting the designated centers, the researcher retrieved a list of women and their contact numbers from the SIB (Integrated Health) system. The women were chosen at random from this list in a proportional way. After that, the researcher contacted the individuals to conduct screenings of themselves and their partners based on the

inclusion and exclusion criteria. Participants were invited to join after the researcher informed them about the study, its procedures, and the importance of anonymity, provided they fulfilled the inclusion criteria.

If the couples agreed to participate, they were asked to attend the health center at a scheduled time along with their spouses. The study's aims and methodology were fully explained to the eligible couples during the visit. If they agreed to participate, written informed consent was obtained. Then, the questionnaires on socio-demographic characteristics, fertility knowledge (Male and Female Fertility Knowledge Inventories (MFKI and FFKI)), and fertility desire (Fertility Desire Scale (FDS)) were completed anonymously by the couples separately.

Measures

The three questionnaires used in the present study included the following:

(1) *Socio-demographic questionnaire*: This questionnaire collected information on various factors, including age, age at marriage, duration of marriage, education level, occupation, adequacy of monthly income, marital satisfaction, cigarette use, alcohol consumption, physical activity, exposure to chemicals, chronic diseases, and sexually transmitted diseases (STDs).

(2) *The Male and Female Fertility Knowledge Inventories (MFKI and FFKI)* assess the fertility awareness of Iranian couples. This tool was first designed by Olekalns and colleagues in Australia in 2018 to measure the fertility knowledge of men and women separately [19]. The FFKI tool is specifically for assessing women's fertility knowledge. It consists of 15 items divided into four factors: Reproductive Health (RH) (3 items), Lifestyle Factors (LSF) (4 items), Chance of Conception (CHC) (3 items), and Ovarian Reserve and Preservation (ORP) (5 items). The MFKI tool is designed to measure men's fertility awareness. It includes 14 items categorized into three factors: Environment and Reproductive Health (ERH) (5 items), Lifestyle Factors (LSF) (4 items), and Sperm Quality (SQ) (5 items). Both tools are completed using a 3-point Likert scale (True, False, and I don't know). Correct answers are scored 1, while incorrect answers and "I don't know" responses receive a score of 0. The minimum score on these questionnaires is 0, and the maximum score is 15 for women and 14 for men. Higher scores indicate higher levels of fertility knowledge. The validity and reliability of the tools in the Australian population were demonstrated with Cronbach's alpha coefficients of 0.78 for women and 0.77 for men [19]. In Iran, Mashayekh-Amiri and colleagues confirmed the reliability and validity of the tools with a Cronbach's alpha of 0.78 for both women and men and internal consistency (ICC) coefficients of 0.98 for women and 0.91 for men [20].

(3) *The Fertility Desire Scale (FDS)* was used to measure the fertility desire of Iranian couples. This questionnaire was developed by Naghibi and colleagues in 2019 in Iran [21]. The FDS consists of 4 subscales: Positive Motivations for Childbearing, which includes seven items (1, 2, 3, 4, 7, 11, and 12); Preferences, which consists of three items (14, 15, and 18); Concerns about Childbearing, which includes four items (5, 6, 8, and 9); and Social Beliefs, which consists of five items (10, 13, 16, 17, and 19). The questionnaire contains 19 items, and responses are scored on a 5-point Likert scale ranging from "Strongly Agree" (score 1) to "Strongly Disagree" (score 5). Some items (5, 6, 8, 9, 17, 16, 13, 10, and 19) are reverse scored. Higher scores indicate a higher level of fertility desire among men and women. Naghibi et al. revealed that the FDS is a valid and reliable tool for measuring fertility desire, with Cronbach's alpha coefficients for the subscales ranging from 0.83 to 0.86 and Intraclass Correlation Coefficients (ICC) ranging from 0.88 to 0.92, well above the acceptable threshold [21].

Sample size

The sample size for this study was calculated based on two variables: fertility knowledge and fertility desire. The sample size for fertility desire was calculated based on the survey by Arasteh et al. regarding the fertility desire of women and men, with the following parameters: (Mean = 66.69, SD = 9.61, d = 0.05), which resulted in a sample size of 106 participants [22]. For fertility knowledge, the study by Olekalns et al. was used [19]. For male fertility knowledge, considering (Mean = 8.86, SD = 3.05, d = 0.05), the sample size was estimated to be 182 participants. For female fertility knowledge, with (Mean = 10.35, SD = 3.19, d = 0.05), the sample size was estimated to be 146 participants. Given that the sample size for male fertility knowledge was higher, cluster sampling (Design effect = 1.5) was applied, and a 15% attrition rate was considered. The final sample size was 310 participants, with 310 couples (310 women and 310 husbands) surveyed in each city (Tabriz, Urmia, and Ardabil).

Statistical analysis

The data was analyzed using SPSS software (Version 25.0, IBM Corp, Armonk, NY, USA). In descriptive statistics, categorical variables were represented by frequency and percentage. Continuous variables were represented by mean and standard deviation. The normality of quantitative data was assessed through visual inspection,

skewness, and kurtosis, which indicated that the data adhered to a normal distribution. In order to compare the scores of the subscales, a normalized score ranging from 0 to 100 was calculated for each subscale.

To investigate the correlation between fertility knowledge and desire scores and the socio-demographic characteristics of couples, one-way analysis of variance (ANOVA) and independent t tests were implemented.

Table 1 Socio-demographic characteristics of Iranian couples attending healthcare centers of Northwest Iran ($n=1834$)

Characteristics	Women ($n=917$)	Men ($n=917$)
	Mean (SD[a])	Mean (SD[a])
Age (Years)	31.94 (6.90)	35.80 (6.52)
Marriage age (Years)	23.78 (6.34)	27.61 (5.85)
Marriage duration (Years)	7.91 (6.24)	7.92 (6.06)
	n (%)	n (%)
Education		
Illiterate or elementary	36 (3.9)	52 (5.7)
Secondary or high school	140 (15.3)	175 (19.1)
Diploma	365 (39.8)	199 (21.7)
University	376 (41.0)	491 (53.5)
Occupation		
Housewife	609 (66.4)	-
Employee	308 (33.6)	267 (29.1)
Un-Employed	-	43 (4.7)
Labor	-	124 (13.5)
Self-employed	-	454 (49.5)
Professionalist/ Manager	-	29 (3.2)
Income		
Inadequate	265 (28.9)	293 (32.0)
Relatively adequate	484 (52.8)	448 (48.9)
Completely adequate	168 (18.3)	176 (19.2)
Marital satisfaction		
Not at all	627 (68.4)	304 (33.2)
Relatively	95 (10.4)	297 (32.4)
Completely	195 (21.3)	316 (34.5)
Smoking		
Yes	101 (11.0)	240 (26.2)
No	816 (89.0)	677 (73.8)
Exercise		
No	307 (33.5)	362 (39.5)
Low	360 (39.3)	322 (35.1)
Modereate/ Prefessional	250 (27.2)	233 (25.4)
Chemical contact		
Yes	35 (3.8)	62 (6.8)
No	882 (96.2)	855 (93.2)
Chronic disease		
Yes	314 (34.3)	228 (24.9)
No	603 (65.8)	689 (75.1)
[b]STD		
Yes	8 (0.9)	13 (1.4)
No	909 (99.1)	904 (98.6)

[*]Standard deviation; [b]STD: Sexual transmitted disease

The following step involved the inclusion of statistically significant variables ($P<0.05$) in the general linear model (GLM) to ascertain the influence of independent variables (such as age, age at marriage, duration of marriage, education, occupation, income sufficiency, and marital satisfaction) on the dependent variables (fertility knowledge and fertility desire). A P-value of less than 0.05 determined statistical significance and all comparisons were two-tailed.

Ethical considerations

The present study was approved by the Ethics Committee of Tabriz University of Medical Sciences (Ethical approval code: IR.TBZMED.REC.1401.211). After providing a comprehensive explanation of the purpose and methodology of the research to all participants, written informed consent was obtained from all of them. Regarding illiterate participants, informed consent was obtained from their legal guardians. Additionally, participants were assured of the confidentiality of the collected data and their right to withdraw from the study at any stage without any consequences.

Results

Socio-demographic characteristics of Iranian couples

In total, 1,834 participants (917 women and 917 husbands) with a response rate of 96.8% were included in the study between January 2023 and September 2023. The mean (SD: standard deviation) age and age at marriage of women were 31.9 (6.9) and 23.8 (6.3) years, respectively. Over a third of the women (41%) had a university education, and nearly two-thirds (66.4%) were homemakers. More than half of the women (52.8%) reported a moderate level of satisfaction with their monthly income. On the other hand, over two-thirds (68.4%) of the women expressed dissatisfaction with their marital life. Additionally, over two-thirds (72.8%) reported low to moderate-professional levels of physical activity. The majority of women did not report smoking (89%), contact with chemicals (96.2%), or chronic illness (65.8%). For the men, the mean (SD) age and age at marriage were 35.8 (6.5) and 27.6 (5.9) years, respectively. More than half of the men (53.5%) had a university education, and nearly half (49.5%) had self-employed jobs. The majority of the men did not report contact with chemicals (93.2%), smoking (73.8%), or chronic illnesses (75.1%). About half of the men (48.9%) were satisfied with their income. Regarding physical activity, 39.5% of men reported never exercising, while 35.1% and 25.4% engaged in low and moderate professional levels of exercise, respectively (Table 1).

Female and male fertility knowledge and desire status

The mean (SD) total score for the FFKI scale in this study was 6.21 (2.50), out of a possible score range of 0 to 15. Women had the highest mean score from the Reproductive Health subscale and the lowest mean score from the Ovarian Reserve and Preservation subscale, with a possible score range of 0 to 100. The mean (SD) total score for the MFKI scale was 6.97 (2.88), out of a possible score range of 0 to 14. Men scored the highest on the Lifestyle Factors subscale and the lowest on the Sperm Quality subscale, with a possible score range of 0 to 100. The mean (SD) total score for the FDS scale in women was 62.86 (14.62), out of a range of 19 to 95. The mean (SD) total score for the FDS scale in men was 63.08 (13.41), also from a score range of 19 to 95. Both women and men scored the highest on the Positive Fertility Motivation subscale and the lowest on the Preferences subscale, with a possible score range of 0 to 100 (Table 2).

Factors associated with fertility knowledge among couples

Based on the results of the bivariate tests (Independent t and one-way ANOVA tests), a statistically significant relationship was found between the overall fertility knowledge score of women and their age ($P=0.015$), age at marriage ($P<0.001$), duration of marriage ($P<0.001$), education level ($P<0.001$), occupation ($P<0.001$), income level ($P=0.013$), and marital satisfaction ($P<0.001$). The variables with $P<0.05$ and women's overall fertility knowledge score were entered into the GLM. After adjusting for the socio-demographic characteristics of the women, the GLM results showed that age, duration of marriage, education level, and occupation were significantly associated with women's fertility knowledge scores. Specifically, after controlling for the effects of all other variables in the model, women aged under 30 years had significantly lower fertility knowledge scores compared to those aged 30 years and older [β (95% CI): -0.51 (-0.87 to -0.15); $P=0.006$]. Additionally, women with a marriage duration of less than 5 years had significantly lower fertility knowledge scores compared to those with a marriage duration of 5 years or more [β (95% CI): -0.74 (-1.12 to -0.36); $P<0.001$]. Women with education levels below a high school diploma and a high school diploma also showed significantly lower fertility knowledge scores compared to women with university education [β (95% CI): -1.72 (-2.25 to -1.19); $P<0.001$] and [β (95% CI): -0.86 (-1.22 to -0.51); $P<0.001$], respectively. Homemakers also had significantly lower fertility knowledge scores compared to employed women [β (95% CI): -0.64 (-0.99 to -0.30); $P<0.001$] (Table 3).

In men, the results of bivariate tests (Independent t and one-way ANOVA tests) showed a statistically significant relationship between the overall fertility knowledge score and education level ($P<0.001$), occupation ($P=0.004$), income level ($P=0.011$), and marital satisfaction ($P=0.003$). After entering the significant variables into the model and adjusting for socio-demographic characteristics, the results of the GLM indicated that education

Table 2 Status of fertility knowledge, desire and its subscales among Iranian couples ($n=1834$)

Variables	Mean (SD[a])	Possible Score Range	Observed Score Range	Mean (SD[a]) Out of 100	Possible Score Range out of 100	Observed Score Range out of 100
Total score of FFKI	6.21 (2.50)	0–15	0–15	41.40 (16.67)	0-100	0-100
Reproductive health	2.15 (1.05)	0–3	0–3	71.67 (35.00)	0-100	0-100
Lifestyle factors	2.61 (1.14)	0–4	0–4	65.25 (28.50)	0-100	0-100
Chance of conception	0.81 (1.01)	0–3	0–3	27.00 (33.67)	0-100	0-100
Ovarian reserve and preservation	0.64 (0.90)	0–5	0–5	12.80 (18.00)	0-100	0-100
Total score of MFKI	6.97 (2.88)	0–14	0–13	49.79 (20.57)	0-100	0-92.86
Environment and reproductive health	2.32 (1.26)	0–5	0–5	46.40 (25.20)	0-100	0-100
Lifestyle factors	2.53 (1.10)	0–4	0–4	63.25 (27.50)	0-100	0-100
Sperm quality	2.12 (1.37)	0–5	0–5	42.40 (27.40)	0-100	0-100
Total score of FDS (Women)	62.86 (14.62)	19–95	22–91	57.71 (19.24)	0-100	3.95–94.74
Positive childbearing motivations	26.01 (6.77)	7–35	7–35	67.89 (24.18)	0-100	0-100
Preferences	11.39 (2.67)	3–15	3–15	69.92 (22.25)	0-100	0-100
Childbearing worries	11.52 (4.00)	4–20	4–20	47.00 (25.00)	0-100	0-100
Social beliefs	13.83 (5.32)	5–25	5–25	44.15 (26.60)	0-100	0-100
Total score of FDS (Men)	63.08 (13.41)	19–95	22–91	58.00 (17.64)	0-100	3.95–94.74
Positive childbearing motivations	25.37 (6.06)	7–35	7–35	65.61 (21.64)	0-100	0-100
Preferences	10.77 (2.64)	3–15	3–15	64.75 (22.00)	0-100	0-100
Childbearing worries	12.02 (3.51)	4–20	4–20	50.13 (21.94)	0-100	0-100
Social beliefs	14.92 (4.76)	5–25	5–25	49.60 (23.80)	0-100	0-100

[a]Standard deviation, FFKI: Female Fertility Knowledge Inventories, MFKI: Male Fertility Knowledge Inventories, FDS: Fertility desire scale

Table 3 The relationship of socio-demographic characteristics with fertility knowledge among Iranian couple based on the General Linear Model ($n=1834$)

Variables (Women)	B (95% CI**)	*P*-value*
Age (Reference: ≥30)		
<30	-0.51 (-0.87 to -0.15)	0.006
Marriage age (Reference: ≥30)		
<30	0.08 (-0.44 to 0.61)	0.763
Marriage duration (Reference: ≥5)		
<5	-0.74 (-1.12 to -0.36)	< 0.001
Education (Reference: University)		
Under- diploma	-1.72 (-2.25 to -1.19)	< 0.001
Diploma	-0.86 (-1.22 to -0.51)	< 0.001
Job (Reference: Employee)		
Housewife	-0.64 (-0.99 to -0.30)	< 0.001
Income (Reference: Completely adequate)		
Inadequate	0.32 (-0.17 to 0.80)	0.199
Relatively adequate	0.29 (-0.12 to 0.70)	0.169
Marital satisfaction (Reference: Satisfied)		
Un-satisfied	-0.31 (-0.70 to 0.08)	0.117
Variables (Men)		
Education (Reference: University)		
Under- diploma	-1.03 (-1.52 to -0.53)	< 0.001
Diploma	-0.69 (-1.20 to -0.18)	0.008
Job (Reference: Professionalist/ Manager)		
Un-Employed	0.10 (-1.24 to 1.44)	0.881
Employee	-0.58 (-1.67 to 0.51)	0.374
Labor	-1.19 (-2.36 to 0.02)	0.055
Self-employed	-0.50 (-1.58 to 0.58)	0.449
Income (Reference: Completely adequate)		
Inadequate	0.63 (-0.10 to 1.17)	0.124
Relatively adequate	-0.11 (-0.61 to 0.38)	0.653
Marital satisfaction (Reference: Satisfied)		
Un-satisfied	-0.74 (-1.12 to -0.36)	< 0.001

*Significant variables ($p<0.05$) in the bivariate analysis were included in a multivariate analysis; ** 95% Confidence Interval

level and marital satisfaction were significantly associated with men's fertility knowledge scores. After controlling for the effects of all other variables in the model, men with education levels below high school diploma and high school diploma had significantly lower fertility knowledge scores compared to men with university education, with the following results: [β (95% CI): -1.03 (-1.52 to -0.53); $P<0.001$] and [β (95% CI): -0.69 (-1.20 to -0.18); $P=0.008$], respectively. Additionally, men dissatisfied with their marital life had significantly lower fertility knowledge scores compared to those satisfied with their marital life [β (95% CI): -0.74 (-1.12 to -0.36); $P<0.001$] (Table 3).

Factors associated with fertility desire among couples

In terms of fertility desire, the results of the bivariate tests showed a statistically significant relationship between the total fertility desire score in women and age at marriage ($P=0.014$), duration of marriage ($P<0.001$), education level ($P<0.001$), occupation ($P=0.044$), income level ($P<0.001$), and marital satisfaction ($P<0.001$). The GLM results indicated that age at marriage, duration of marriage, income level, and marital satisfaction were significantly associated with women's fertility desire scores. Women with age at marriage younger than 30 years, compared to those with age at marriage of 30 years or older, had significantly lower fertility desire scores [β (95% CI): -3.74 (-6.23 to -1.24); $P=0.003$]. Additionally, women with a marriage duration of less than 5 years compared to those with a marriage duration of 5 years or more had significantly higher fertility desire scores [β (95% CI): 9.84 (7.95 to 11.73); $P<0.001$]. Women with a high school education compared to those with a university education showed significantly higher fertility desire scores [β (95% CI): 2.43 (0.53 to 4.32); $P=0.012$]. Women with inadequate and relatively adequate income, compared to those with completely adequate income, showed significantly higher fertility desire scores, with [β (95% CI): 8.62 (6.03 to 11.21); $P<0.001$] and [β (95% CI): 2.67 (0.45 to 4.88); $P=0.018$], respectively. On the other hand, women dissatisfied with their marital life, compared to those satisfied, reported significantly lower fertility desire scores [β (95% CI): -2.40 (-4.48 to -0.32); $P=0.024$] (Table 4).

In men, there was also a statistically significant relationship between the total fertility desire score and the variables of age at marriage ($P<0.001$), duration of marriage ($P<0.001$), education level ($P=0.011$), occupation ($P<0.001$), income level ($P<0.001$), and marital satisfaction ($P=0.001$). According to the results of the GLM, men with an age at marriage under 30 years, compared to those with an age at marriage of 30 years or older, had significantly lower fertility desire scores [β (95% CI): -3.28 (-4.94 to -1.61); $P<0.001$]. Additionally, men with a marriage duration of less than 5 years compared to those with a marriage duration of 5 years or more had significantly higher fertility desire scores [β (95% CI): 5.99 (4.26 to 7.72); $P<0.001$]. Men with a below high school education compared to those with a university education showed significantly higher fertility desire scores [β (95% CI): 3.77 (1.74 to 5.79); $P<0.001$]. Men with inadequate or relatively adequate income compared to those with completely adequate income showed significantly higher fertility desire scores, with [β (95% CI): 10.63 (8.37 to 12.89); $P<0.001$] and [β (95% CI): 2.87 (0.87 to 4.87); $P=0.005$], respectively. Moreover, men dissatisfied with their marital life, compared to those satisfied, reported significantly lower fertility desire scores [β (95% CI): -2.27 (-3.83 to -0.70); $P=0.005$] (Table 4).

Table 4 The relationship of socio-demographic characteristics with fertility desire among Iranian couple based on the General Linear Model ($n = 1834$)

Variables (Women)	B (95% CI**)	*P*-value*
Marriage age (Reference: ≥30)		
<30	-3.74 (-6.23 to -1.24)	0.003
Marriage duration (Reference: ≥5)		
<5	9.84 (7.95 to 11.73)	< 0.001
Education (Reference: University)		
Under- diploma	-0.33 (-3.18 to 2.53)	0.822
Diploma	2.43 (0.53 to 4.32)	0.012
Job (Reference: Employee)		
Housewife	-0.86 (-2.71 to 0.98)	0.360
Income (Reference: Completely adequate)		
Inadequate	8.62 (6.03 to 11.21)	< 0.001
Relatively adequate	2.67 (0.45 to 4.88)	0.018
Marital satisfaction (Reference: Satisfied)		
Un-satisfied	-2.40 (-4.48 to -0.32)	0.024
Variables (Men)		
Marriage age (Reference: ≥30) <30		
>30	-3.28 (-4.94 to -1.61)	< 0.001
Marriage duration (Reference: ≥5)		
<5	5.99 (4.26 to 7.72)	< 0.001
Education (Reference: University)		
Under- diploma	3.77 (1.74 to 5.79)	< 0.001
Diploma	0.42 (-1.66 to 2.49)	0.694
Job (Reference: Professionalist/ Manager)		
Un-Employed	-1.81 (-7.26 to 3.64)	0.514
Employee	2.46 (-1.93 to 6.85)	0.272
Labor	3.36 (-1.36 to 8.09)	0.162
Self-employed	-0.37 (-4.74 to 4.00)	0.868
Income (Reference: Completely adequate)		
Inadequate	10.63 (8.37 to 12.89)	< 0.001
Relatively adequate	2.87 (0.87 to 4.87)	0.005
Marital satisfaction (Reference: Satisfied)		
Un-satisfied	-2.27 (-3.83 to -0.70)	0.005

*Significant variables ($p < 0.05$) in the bivariate analysis were included in a multivariate analysis; ** 95% Confidence Interval

Discussion

Concerns about fertility and population dynamics are not new and will undoubtedly continue. Therefore, to our knowledge, this study is the first to examine the knowledge, fertility desire and the associated factors among Iranian couples in the northwest region of Iran. The results of this study revealed that factors such as age, duration of marriage, education level, and occupation significantly influenced women's fertility knowledge. In contrast, education level and marital satisfaction affected men's fertility knowledge. Additionally, fertility desire in both women and men were associated with factors such as age at marriage, duration of marriage, education level, marital satisfaction, and income level.

Women had the highest mean score in the reproductive health subscale and the lowest in the ovarian reserve and preservation subscale. Moreover, men had the highest mean score in the Lifestyle Factors subscale and the lowest in the Sperm Quality subscale. In contrast to the findings of our study, the study by Zalewska et al. (2024) regarding women's knowledge of reproductive health found that women had a low level of knowledge about reproductive health, and there was no correlation with their age, education level, or previous experiences [23]. An explanation for this difference could be their study's smaller sample size (111 participants), which included infertility cases. In men, aligning with our findings, the Daumler et al. (2016) survey on men's knowledge of their own fertility among 701 Canadian men, found that men had more knowledge about lifestyle and modifiable infertility factors [24].

According to the results, both women and men had the highest mean scores in the Positive Motivations for Childbearing subscale and the lowest in the subscale of Preferences. In contrast, in the study by Arasteh et al. (2021), the highest scores were related to Preferences, while the lowest scores were associated with concerns about childbearing [22]. In this regard, the study by Schwartz et al. (2015) on 1410 Australian childbearing women with a gestational age of ≤ 24 weeks, showed that increased self-efficacy could lead to a more positive attitude toward childbearing and improved psychological well-being. This, in turn, reduces anxiety about childbearing and strengthens the desire to have children [25].

The factors identified as being related to Iranian couples' fertility knowledge in the present study align with the results of previous studies on this subject. In the present study, a higher age of women was identified as one of the factors influencing the level of knowledge. On the occasion of Fertility Day, one of the slogans that strongly attracted attention, reflecting current concerns about couples' lack of knowledge regarding the postponement of childbearing, was: "Beauty has no age, but pregnancy does" [26]. Undoubtedly, a woman's age plays a crucial role in fertility knowledge. The older the woman is at the beginning of her marriage, the sooner the couple tends to have their first child [27].

The results of a systematic review study (from 26 countries and with sample sizes ranged from 20 to 7036 individuals) on 71 research articles by Pedro et al. (2018) on fertility awareness and related factors showed a contradictory relationship between the participant's age and fertility awareness. Some studies (9 studies) indicated that older participants had higher fertility awareness, which aligns with the results of the present study. However, 11 studies found no significant relationship between age and fertility awareness, and only one study showed

that younger participants (under 30 years old) had higher fertility awareness [28].

Another factor influencing women's knowledge is the duration of marriage. In the present study, women in the first 5 years of marriage had less fertility knowledge than women who had been married for more than 5 years. Mahmudiani et al. (2023) investigated 1065 married women's fertility knowledge and their number of children ever born in Iran. They results showed that as the age of women and their husbands increased, the number of their children also increased due to higher knowledge. With each additional year of age for women and their husbands, the number of children increases by 0.123 and 0.237 units, respectively [29]. The increase in the age of women and their husbands may indicate a longer duration of marriage, which is consistent with the results of the present study. Previous studies have also shown that the duration of marriage affects fertility knowledge in couples [30, 31].

The following factors influencing women's and men's knowledge are their education and occupation level. The global trend of postponing childbearing is attributed to factors such as pursuing higher education and career goals. In this regard, a study by Pedro et al. showed that 30 studies examined the relationship between education level and fertility awareness in couples. Among them, the results of 18 studies indicated a link between higher education and increased fertility awareness. Five studies found no significant relationship, and the results of one study showed that participants with university degrees had higher fertility awareness than those with non-university education [28].

Our findings also show that education level is significantly related to fertility knowledge. Women with higher education may seek more information through various sources and, as a result, gain higher knowledge, which aligns with existing evidence in this field. Additionally, Mahmudiani et al.'s (2023) study on women's fertility knowledge and their number of children ever born showed that increasing women's education due to greater knowledge of the factors influencing childbearing leads to a decrease in the number of children. In other words, with each additional year of education, the number of children decreases by 0.142 units, which may be related to higher knowledge in women [29]. On the other hand, the results of Mahey et al.'s (2018) study on the fertility awareness and knowledge among 205 Indian women attending an infertility clinic, showed that even women from higher and middle socioeconomic groups were not aware of their fertility period [32].

Hampton et al. also stated that there is no relationship between high fertility awareness and socioeconomic status [33]. This contrasts with the assumption that higher education and social status indicate greater fertility knowledge, as shown in Bunting et al.'s (2013) study [34]. Furthermore, regarding the relationship between women's employment status and their level of knowledge, the results of Virtala et al.'s study showed that career goals are more significant for younger women, as they may postpone childbearing to achieve other priorities, possibly due to their higher knowledge of assisted reproductive treatments and optimism about their outcomes [35]. Similarly, the findings of our study also showed that women's employment status is significantly related to their level of knowledge.

Marital satisfaction in men was also identified as a factor related to fertility knowledge in the present study, aligning with the results of some studies conducted in this area. The nature of the relationship between couples and their marital satisfaction, as a social determinant of health, has played a significant role in decision-making about postponing childbearing at various stages of life. Ranjbar et al.'s (2024) study on fertility knowledge, childbearing intentions and attitudes regarding parenthood on 1405 Iranian men (18 to 45 years old) and 1533 women (18 to 35 years old) showed that maintaining a stable relationship and marital satisfaction is considered the most crucial factor in making decisions about childbearing [36]. The present study found that marital satisfaction is one of the factors associated with fertility knowledge in men. Additionally, the results of Hammarberg et al.'s (2017) study on fertility knowledge, attitudes, and behaviors in men showed that the ideal conditions for having children include having a stable and loving relationship, higher education, permanent employment, reliable income, personal maturity, and having a partner who is seen as "suitable" [37]. Previous studies have also demonstrated this result [38, 39].

Fertility desire in Iranian women and men are associated with factors such as age at marriage, duration of marriage, education level, marital satisfaction, and income, which align with the results of some studies conducted in this area. The present study showed that a higher age at marriage and higher education levels in both Iranian women and men were significantly associated with their desire for childbearing. There are contradictory results in this field. In this regard, Haq et al.'s (2023) study on factors related to women's fertility in Bangladesh showed that as women's age at marriage and duration of marriage increased, the number of children they had also increased. However, if women's education level increased, the number of children decreased. Women with secondary or higher education were less likely to have children than illiterate women [40]. Additionally, the results of Kumar Saya et al.'s (2021) study on fertility desire and the identification of related factors among 2,228 Indian couples showed that fertility desire were significantly higher in younger women, those with

higher socioeconomic status, and women without children or with only one child [17]. Furthermore, the results of Araban et al.'s study on identifying factors related to childbearing intentions in 483 Iranian women (15–49 years), showed that variables such as age, education level, employment status, spouse's education level, both spouses' employment status, attitudes, subjective norms, hope, perceived social support, and marital satisfaction were significant predictors of childbearing intentions [39]. The higher desire to limit childbearing among educated Iranian women and men may be due to their lack of time to have children while pursuing educational goals [41]. However, this finding contradicts a previous study conducted in Ethiopia, which found that the more educated women were, the less likely they were to want children [42]. Further studies may be needed to understand how education level is related to preferences for having more children.

One of the factors related to fertility desire identified in the present study was marital satisfaction. The quality of the marriage relationship is a multifaceted concept. Studies have shown that couples in successful relationships have a stronger desire to have children. On the other hand, couples with weak relationships may view children as a means to strengthen their bond and save their marriage, which is associated with long-term negative consequences in the future [3, 9]. In this regard, the results of Kariman et al.'s (2016) study highlighted concerns about increasing marital instability as one of the reasons for doubt and lack of desire for childbearing [43]. Additionally, the results of Arikawa et al.'s (2020) study on childbearing desire and reproductive behaviors among 1631 women with HIV in Abidjan, showed that having a stable relationship was significantly associated with an increased desire to have children [44].

The income level of couples was another factor identified in the present study that showed a significant relationship with their fertility desire. The present study's findings showed that couples with insufficient income had a stronger desire to have children than those who were satisfied with their income. In this regard, the results of Kidie et al.'s (2024) study in Ethiopia, with 12,019 participants, showed that couples living in smaller, peripheral, and poorer areas had less desire to limit childbearing compared to couples residing in central and larger regions of Ethiopia, which could indicate lower knowledge in these couples. In other words, communities with higher poverty rates were 28% less likely to limit childbearing [45]. Adhikari et al.'s study also showed that fertility desire were higher among rural mothers, women with lower economic status, and unemployed women [46]. This may be because women with lower wealth indices often perceive their children as valuable assets and investments that will repay them in old age [47]. Consistent with our findings, a study in Bangladesh showed a negative relationship between the wealth index and the desired family size, meaning that the higher the wealth index, the smaller the family size [48].

Strengths and limitations

According to our findings, this study is the first to simultaneously examine fertility knowledge, desire and associated factors in Iranian couples. As a result, by identifying the factors associated with fertility knowledge and desire, the present study provides a valuable basis for developing interventions in line with fertility policies. A major strength of this study is the large sample size and the fact that it was sampled from the northwest region of Iran (Tabriz, Ardabil, and Urmia). Although many studies have been conducted to assess fertility knowledge, most of these studies focus on women and overlook the importance of men in this two-sided equation. Since childbearing and parenting are joint efforts, understanding men's fertility knowledge is crucial for improving fertility and family-related health and public education programs that help women and men achieve their parenting goals. Therefore, examining knowledge and desire in couples is another strength of the present study. Many of the tools designed to measure fertility knowledge do not include information on men's fertility knowledge and are relatively limited in scope. This gap in fertility health education, particularly for men, has been confirmed by several researchers who call for changes in fertility health education. As a result, the tool used in this study measures fertility knowledge separately and precisely for both men and women.

However, this study had some limitations. This was a cross-sectional study, so it cannot explore causal relationships between various variables and fertility knowledge and desire. Therefore, more prospective research is needed in this area. Finally, the results of this study only reflect the situation in Iran. Due to the different policy implementations in health systems across countries, the conclusions may not apply to other countries.

Conclusion

The present study's findings indicate that the fertility knowledge and desire among Iranian couples were linked to their demographic and social characteristics. Since infertility and the lack of fertility desire continue to be global public health issues, imposing high costs on healthcare systems and individuals, it appears that addressing this issue through investigating internal influencing factors such as knowledge and desire in couples could help mitigate this problem to some extent. In this regard, health policymakers should design interventions and programs to create favorable conditions for long-term fertility. These measures should focus on family and

community levels, emphasizing educational, cultural, economic, and supportive dimensions. In terms of education, healthcare providers providing counseling services to young and childless or one-child couples, focusing on strengthening marital life skills, could be beneficial. For cultural awareness, preventing the institutionalization of the "fewer children, better life" culture through appropriate media campaigns and the installation of posters in the community, as well as promoting attitude changes towards childbearing, can be implemented. Additionally, initiatives to facilitate marriage, particularly among educated individuals, could be encouraged. On the economic front, efforts should focus on strengthening the financial foundations of families rather than providing temporary promises. Addressing youth unemployment and economic insecurity through economic infrastructure reforms, improving social welfare, reducing infertility treatment costs, and offering tax incentives for large families should also be prioritized. Moreover, implementing and enforcing supportive employment laws for women, encouraging and providing social support through insurance systems and social rewards, taking measures to improve women's experiences with childbirth, and providing specific insurance support for infertile couples should be considered. It seems that the findings of this study can serve as a valuable guide for health policymakers in overcoming fertility barriers and increasing the population in Iran.

Abbreviations

MFKI	Male Fertility Knowledge Inventories
FFKI	Female Fertility Knowledge Inventories
ERH	Environment and reproductive health
LSF	Lifestyle factors
SQ	Sperm quality
RH	Reproductive health
CHC	Chance of conception
ORP	Ovarian reserve and preservation
FDS	Fertility desire scale
GBD	Global burden of disease
CCF50	Completed cohort fertility at age 50 years
TFR	Total fertility rate
STD	Sexual transmitted disease
WHO	World health organization
GLM	Generalized linear model
SD	Standard deviation
CI	Confidence interval
ANOVA	Analysis of variance

Acknowledgements
We acknowledge the Clinical Research Development Unit of Taleghani Hospital, Tabriz University of Medical Sciences, Tabriz, Iran, for scientific support.

Author contributions
MM, SMA, FA and BM contributed to the design of the study. FR, EH, MM and SMA contributed to the implementation and analysis plan. SMA and MM has written the first draft of this article and all authors have critically read the text and contributed with inputs and revisions, and all authors read and approved the final manuscript.

Funding
This Study is funded by Tabriz University of Medical Sciences (grant number: 69822). The funding source had no role in the design and conduct of the study, and decision to this manuscript writing and submission.

Data availability
The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The current study was approved by the Ethics Committee of Tabriz University of Medical Sciences [Ethical approval code: IR.TBZMED.REC.1401.211].Written Informed consent to participate in the study was obtained from all the participants before enrolment. Regarding illiterate participants, informed consent was obtained from their legal guardians. All methods were carried out in accordance with the Declaration of Helsinki.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]Department of Midwifery, Faculty of Nursing and Midwifery, Golestan University of Medical Sciences, Gorgan, Iran
[2]Department of Psychiatry, Faculty of Medicine, Ardabil University of Medical Science, Ardabil, Iran
[3]Reproductive Health Research Center, Midwifery Department, Faculty of Nursing and Midwifery, Instructor, Urmia University of Medical Sciences, Urmia, Iran
[4]Students Research Committee, Midwifery Department, Faculty of Nursing and Midwifery, Shahid beheshti University of Medical sciences, Tabriz, Iran
[5]Department of Midwifery, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran
[6]Social Determinants of Health Research Center, Department of Midwifery, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran

Received: 29 November 2024 / Accepted: 17 March 2025
Published online: 27 March 2025

References

1. Motlagh ME, Taheri M, Eslami M. Factors affecting the fertility preferences in Iranian ethnic groups. Nurs Midwifery J. 2016;14(6):485–95.
2. Resolution A. RES/70/1. Transforming our world: the 2030 agenda for sustainable development. Volume 25. New York: Seventieth United Nations General Assembly; 2015. pp. 86–97.
3. The Lancet. The fertility industry: profiting from vulnerability. Lancet. 2024;404(10449):215.
4. Global fertility. in 204 countries and territories, 1950–2021, with forecasts to 2100: a comprehensive demographic analysis for the Global Burden of Disease Study 2021. Lancet. 2024;403(10440):2057–99.
5. https://population.un.org/wpp/Download/Standard/. UWPPTRWPP.
6. Kalantari S, Abaszadeh M, Amin-Mozafari F, Rakei-Bonab N. Sociological evaluation of affinity to child bearing and some related factors: married adolescents of Tabriz district case study. J Appl Sociol. 2010;37(1):83–104.
7. Gietel-Basten S, Marois G, Torabi F, Kabiri K. Reframing policy responses to population aging in Iran. Genus. 2024;80(1):8.
8. Khadivzadeh T, Rajati R, Esmaeili H, Danesh F. The relationship of the current and desired number of children with the quality of marital relationship and fertility motivations among employed women and their husbands. JMRH. 2021;9(1):2573–81.
9. Daniluk JC, Koert E. The other side of the fertility coin: a comparison of childless men's and women's knowledge of fertility and assisted reproductive technology. Fertil Steril. 2013;99(3):839–46.

10. Zegers-Hochschild F, Adamson GD, Dyer S, Racowsky C, de Mouzon J, Sokol R, et al. The International Glossary on Infertility and Fertility Care, 2017. Fertil Steril. 2017;108(3):393–406.
11. Mohammadi H, Kamali K, Jahanfar S, Ranjbar F. Fertility knowledge and its related factors among married men and women in Zanjan, Iran. Hum Fertil (Camb). 2023;26(2):249–56.
12. Central Statistical Agency (CSA). [Ethiopia] and ICF. Ethiopia demographic and health survey 2016: key indicators report. Addis Ababa and Rockville MCal.
13. van Wijk D. Higher incomes are increasingly associated with higher fertility. Demographic Res. 2024;51:809–22.
14. Dorahaki A, Mahmoudiani S, Akhawan Armaki M. The impact of marital life satisfaction on the number of children ever born to women: a study from Kashan, Iran. Payesh (Health Monitor). 2023;22(3):345–54.
15. Nitsche N, Hayford SR. Preferences, partners, and parenthood: Linking early fertility desires, marriage timing, and achieved fertility. Demography. 2020;57(6):1975–2001.
16. Omid M, Shahhosseini Z, Hosseinnataj A, Zamaniyan M, Ganji J. Investigating the Factors Related to Desire to Have Children: A Systematic Review. JMUMS. 2024;34(232):246–59.
17. Saya GK, Premarajan KC, Roy G, Sarkar S, Kar SS, Ulaganeethi R, et al. Current fertility desire and its associated factors among currently married eligible couples in urban and rural area of Puducherry, south India. Afr Health Sci. 2021;21(3):1385–95.
18. Mousavi S, Ghafelebashi M. A study of attitudes towards childbearing in young families of Qazvin city. Woman and family studies. 2014.
19. Olekalns A. Assessing fertility knowledge: development and validation of the male and female fertility knowledge inventories. 2018.
20. Mashayekh-Amiri S, Asghari Jafarabadi M, Molaie B, Rashidi F, Hemati E, Aliasghari F, et al. Validation and measurement properties of the Male and Female Fertility Knowledge Inventories (MFKI and FFKI) in Iranian couples. Reprod Health. 2024;21(1):57.
21. Naghibi SA, Khazaee-Pool M. Psychometric properties of fertility desire scale (FDS) developed for Iranian parents. BMC Public Health. 2019;19(1):1113.
22. Arasteh A, Akbariyan A, Asadi F. Comparing factors influencing fertility desire among urban and rural families referring to healthcare centers in Ferdows, Iran, in 2020. Epidemiol health Syst j. 2022;9(3):107–12.
23. Zalewska O, Wszołek K. Women's Awareness of Reproductive Health. Med (Kaunas). 2024;60(1).
24. Daumler D, Chan P, Lo KC, Takefman J, Zelkowitz P. Men's knowledge of their own fertility: a population-based survey examining the awareness of factors that are associated with male infertility. Hum Reprod. 2016;31(12):2781–90.
25. Schwartz L, Toohill J, Creedy DK, Baird K, Gamble J, Fenwick J. Factors associated with childbirth self-efficacy in Australian childbearing women. BMC Pregnancy Childbirth. 2015;15:29.
26. Sobotka T, Zeman K, Potančoková M, Eder J, Brzozowska Z, Beaujouan É et al. Fertility datasheet 2015. Vienna Institute of Demography/Wittgenstein Centre for Demography and Global Human Capital (IIASA, VID/ÖAW, WU). 2015.
27. Hashemzadeh M, Shariati M, Mohammad Nazari A, Keramat A. Childbearing intention and its associated factors: A systematic review. Nurs Open. 2021;8(5):2354–68.
28. Pedro J, Brandão T, Schmidt L, Costa ME, Martins MV. What do people know about fertility? A systematic review on fertility awareness and its associated factors. Ups J Med Sci. 2018;123(2):71–81.
29. Mahmoudiani S. Women's fertility knowledge and their number of children ever born: A cross-sectional study in Shiraz, Iran. Health Sci Rep. 2023;6(4):e1179.
30. Alazbih NM, Kaya AH, Mengistu MY, Gelaye KA. Determinants of time to first marriage and birth intervals among women of child bearing age in Dabat Health and demographic surveillance system site, Northwest Ethiopia. PLoS ONE. 2023;18(2):e0281997.
31. Yang Y, He R. Second-Child Fertility Intentions among Urban Women in China: A Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2023;20(4).
32. Mahey R, Gupta M. Fertility awareness and knowledge among Indian women attending an infertility clinic: a cross-sectional study. BMC Womens Health. 2018;18(1):177.
33. Hampton KD, Mazza D, Newton JM. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. J Adv Nurs. 2013;69(5):1076–84.
34. Bunting L, Tsibulsky I, Boivin J. Fertility knowledge and beliefs about fertility treatment: findings from the International Fertility Decision-making Study. Hum Reprod. 2013;28(2):385–97.
35. Virtala A, Vilska S, Huttunen T, Kunttu K. Childbearing, the desire to have children, and awareness about the impact of age on female fertility among Finnish university students. Eur J Contracept Reprod Health Care. 2011;16(2):108–15.
36. Ranjbar F, Gharacheh M, Khalajabadi Farahani F, Montazeri S, Mirghafourvand M, Sadeghi T, et al. P-461 Fertility knowledge, childbearing intentions and attitudes regarding parenthood among men and women about to get married in Iran. Hum Reprod. 2024;39(Supplement1):deae108.
37. Hammarberg K, Collins V, Holden C, Young K, McLachlan R. Men's knowledge, attitudes and behaviours relating to fertility. Hum Reprod Update. 2017;23(4):458–80.
38. Modena F, Sabatini F. I would if I could: Precarious employment and childbearing intentions in Italy. Rev Econ Househ. 2012;10:77–97.
39. Araban M, Karimy M. Factors related to childbearing intentions among women: a cross-sectional study in health centers, Saveh, Iran. J Egypt Public Health Assoc. 2020;95(1):6.
40. Haq I, Hossain MI, Saleheen AAS, Nayan MI, Afrin T, Talukder A. Factors associated with women fertility in Bangladesh: application on count regression models. Curr Women's Health Reviews. 2023;19(2):26–37.
41. Negash WD, Belachew TB, Asmamaw DB, Bitew DA. Predictors of desire to limit childbearing among reproductive age women in high fertility regions in Ethiopia. A multilevel mixed effect analysis. BMC Public Health. 2023;23(1):1011.
42. Muluneh EK, Molla HL. Factors influencing desired number of children among Ethiopian women: Application of count regression models. Ethiop J Sci Technol. 2022;15(2):141–54.
43. Kariman N, Amerian M, Jannati P, Salmani F, Hamzekhani M. A path analysis of factors influencing the first childbearing decision-making in women in Shahroud in 2014. Glob J Health Sci. 2016;8(10):55381.
44. Arikawa S, Dumazert P, Messou E, Burgos-Soto J, Tiendrebeogo T, Zahui A, et al. Childbearing desire and reproductive behaviors among women living with HIV: A cross-sectional study in Abidjan, Côte d'Ivoire. PLoS ONE. 2020;15(10):e0239859.
45. Kidie AA, Aychiluhm SB, Ayal BG, Kodo TK, Fentie EA, Masresha SA, et al. Women's desire to limit child-bearing and its associated factors in rural Ethiopia: A multilevel analysis. Heliyon. 2024;10(3):e25372.
46. Adhikari R. Demographic, socio-economic, and cultural factors affecting fertility differentials in Nepal. BMC Pregnancy Childbirth. 2010;10:19.
47. Chandra-Mouli V, McCarraher DR, Phillips SJ, Williamson NE, Hainsworth G. Contraception for adolescents in low and middle income countries: needs, barriers, and access. Reprod Health. 2014;11(1):1.
48. Uddin MI, Bhuyan K, Islam SS. Determinants of desired family size and children ever born in Bangladesh. J Fam Welf. 2011.

Publisher's note