

Research

Prevalence, reasons, and attitude towards abortion among Iranian married women of reproductive age in Qazvin province

Mehran Alijanzadeh¹ · Nahid Yazdi² · Masomeh Alamshahi² · Mark D. Griffiths³ · Zainab Alimoradi¹

Received: 27 May 2024 / Accepted: 21 October 2024

Published online: 25 October 2024

© The Author(s) 2024 [OPEN](#)

Abstract

Background and aims Abortion influences the composition and size of population. Estimating the overall and type-specific abortion rates, the reasons to choose the abortion can be helpful in designing and implementing preventive intervention. Therefore, the present study was designed to determine the: (i) prevalence of abortion, (ii) attitude of married women of reproductive age towards abortion, and (iii) reasons for choosing abortion by married women of reproductive age in Qazvin province.

Methods A cross-sectional study was conducted between February and April 2023, and comprised married women of reproductive age (N = 1571) referred to urban and rural comprehensive health centers in five cities of Qazvin province. Utilizing multi-stage proportional sampling process, data for the survey (including demographic and fertility information, reasons for choosing abortion, and attitudes toward abortion) were collected online.

Results The lifetime prevalence of abortion was 18.6% (among the total sample). The past-year prevalence was 22.3% (among those who reported having had an abortion). Of those reporting having had an abortion, 73.6% reported it was their first one, and 65.1% reported it was non-spontaneous. Women's reasons for choosing abortion fell into one of three main clusters: (i) couple's behavior, health and relationship problems, (ii) fertility-related stressful experiences, and (iii) family economic situations. The main reported reason to choose abortion was a couple's behavior (e.g., drug use), health (e.g., physical disease, psychological problems), and relationship problems (e.g., sexual infidelity, divorce) explaining 27% of the variance. Also, pro-abortion attitude was the most important attitude towards non-spontaneous abortion explaining 26.33% of variance. The variables that increased the likelihood of non-spontaneous abortion included choosing a reason for abortion vs. having no reason (OR = 1.77, $p = 0.05$), having poor vs. good mental health (OR = 1.74, $p = 0.03$), having a pro-abortion attitude (OR = 1.09, $p = 0.09$), and having ≥ 3 children vs. having no children (OR = 0.53, $p = 0.06$).

Conclusion Women in high-risk groups for non-spontaneous abortion (i.e., those aged over 35 years, those married for more than five years, those with an infertility history, those with a lower number of children, those living in rural areas, and those having poor mental health status) should be assessed by primary healthcare services during preconception and have early prenatal counseling to help in decisions regarding abortion.

Keywords Abortion · Prevalence · Attitudes · Iran

✉ Zainab Alimoradi, Zainabalimoradi@yahoo.com; Mehran Alijanzadeh, mehran_alijanzade@yahoo.com; Nahid Yazdi, n.yazdi@qums.ac.ir; Masomeh Alamshahi, am.alamshahi@gmail.com; Mark D. Griffiths, mark.griffiths@ntu.ac.uk | ¹Social Determinants of Health Research Center, Research Institute for Prevention of Non-Communicable Diseases, Qazvin University of Medical Sciences, Qazvin, Iran. ²Deputy of Health, Qazvin University of Medical Science, Qazvin, Iran. ³International Gaming Research Unit, Psychology Department, Nottingham Trent University, Nottingham, UK.



1 Introduction

Childbearing is the most important influential factor in changing population structure and size [1]. At present, many developed and developing countries have experienced the total fertility rate (TFR) at or below the replacement level (TFR < 2.1 children) [2]. Having a TFR > 2.1 is the most important factor in the change and transformation of the size, growth rate and structure of the population in a country [3].

Over the past four decades, Iran is one of the countries that has experienced a sharp decrease in total TFR from 6.9 children in 1984 [4] to 1.65 children in 2021 [5]. Due to the decrease in TFR and increase in life expectancy in Iran, it is predicted that the elderly population will increase from less than 10% in 2015 to more than 30% in 2050 [6]. Considering the importance of fertility level and population structure changes in Iran, research examining the factors influencing the population size and structure is needed, especially fertility-related factors.

The fertility level of any population depends not only on a large number of biological factors but also on a wide variety of cultural norms and social experiences [7]. Desire and tendency to have children depend on various factors such as lifestyle changes, couple's education level, increase in women's employment and their economic and social independence, family's economic and social status, economic factors and the provision of welfare facilities by governments, the age of the couple at the time of marriage, number of children, age at the time of first pregnancy, and awareness of contraceptives [8, 9]. In addition to all of these aforementioned factors, abortion is considered as one of important factors influencing the composition and size of population [10, 11]. Considering that abortion is still considered a highly sensitive and socially stigmatized behavior in many countries, it is a difficult to accurately determine the prevalence and is often underreported [11].

There are two main types of abortion (i.e., spontaneous abortion and induced abortion). Spontaneous abortion refers to a natural pregnancy loss before 20 weeks of gestation (i.e., miscarriage) [12], whereas induced abortion refers to deliberate termination of pregnancy [13]. The most common reasons for induced abortions are the timing not being right to have a baby and limiting the family size [13]. Induced abortion (i.e., intentional medical or surgical termination of pregnancy for any reason), is one of the factors that affects a country's fertility rate. Globally, the highest overall abortion rate is observed in middle-income countries and the lowest in high-income countries. The rate per 1000 among women aged 15–49 years is 44 in middle-income countries, 38 in low-income countries, and 15 in high-income countries [14–16]. Induced abortions occur for various reasons, including unwanted pregnancies due to the failure or non-use of contraceptive methods, sexual assault, changes in conditions during pregnancy, including health concerns if the pregnancy continues, financial concerns, lack of preparation in accepting the parental role, the need for space or to limit childbirth, the influence of important individuals (such as partner and family), lack of support for the pregnancy by partners or family members, career and educational goals, and the stigma of pregnancies such as teenage pregnancies or pregnancies due to rape [17–20].

Globally, it is estimated that between 2015 and 2019, approximately 30% of all pregnancies (equivalent to 61% of unintended pregnancies) resulted in induced abortion [14, 16]. Globally, between 2010 and 2014, 45% of abortions were unsafe, with 97% of unsafe abortions occurring in low- and middle-income countries. The proportion of all abortions that are unsafe is approximately four times higher in middle- and low-income countries (49.5%) compared to high-income countries (12.5%). The rate of unsafe abortion is 0.9% in North America, 2.1% in Northern Europe, 37.8% in Asia, 75.6% in Africa, and 76.4% in Latin America [15]. While the difference in rates of unsafe abortion and related morbidity and mortality varies considerably according to a country's GDP, the overall rate of induced abortion worldwide is somewhat similar [17].

In Iran, there are no accurate statistics regarding the rate of abortion in general, and the rate of induced abortions specifically. However, it is estimated that 80,000 induced abortions take place in Iran every year [21, 22]. Because Iran has experienced a sharp decrease in TFR, one of the targets in the Government's new population policies is to save the life of every fetus to increase the country's TFR [23]. In this regard, identifying the reasons for choosing abortion and attitudes towards abortion among married reproductive age women is important and could help in the design and implementation of preventive interventions for successful pregnancies and childbirth among couples [24]. In an attempt to prevent induced abortion (because abortion is not viewed positively in Iranian culture), repressive laws and policies have been introduced regarding the act of induced abortion (i.e., in Islamic law, abortion is now a crime punishable by fines and imprisonment, and revocation of medical licenses), but they appear to have had little effect on decreasing induced abortion rate [22], and have not been suitable solutions to prevent intentional abortions [25]. Therefore, estimating the prevalence of both spontaneous and induced abortion rates in Iran and the reasons for having an abortion could be

helpful in designing and implementing prevention and intervention programs [22]. Therefore, the present study was designed to determine the: (i) prevalence of abortion among married women of reproductive age in Qazvin (a province in Iran), (ii) attitude of married women of reproductive age in the province towards abortion, and (iii) reasons for choosing abortion by married women of reproductive age in the province.

2 Methods

2.1 Study design and setting

A cross-sectional study was conducted between February and April 2023. The participants comprised married women of reproductive age referred to urban and rural comprehensive health centers in five cities of Qazvin province including Qazvin, Takestan, Alborz, Boyin Zahra and Avaj, utilizing a multi-stage proportional sampling process.

Qazvin province is one of the 31 provinces of Iran and is located in the northwestern part of the country. The area of this province is about 15,820 square kilometers. This province has six main cities. According to 2016 statistics, the population of Qazvin province was 1,273,759 individuals, of which 74.75% were living in urban areas and 25.25% were living in rural areas. Qazvin was chosen as the study site in the present study because it is one of the provinces that had a lower total fertility rate than the Iran's total fertility rate in 2021 (1.44 versus 1.65 [5]). Moreover, there are no accurate statistics concerning the prevalence of abortion in this province. In Qazvin province, health center officials and their employees pay special attention to evidence-based information and actively participate with researchers in studies in order to help solve the problems of the province [26].

2.2 Sample size estimation

According to the estimated prevalence of abortion based on previous studies [27], the p -value was equal to 30% and the value of d was equal to 3% and $\alpha = 0.05$. The total sample size was estimated to be 1000. Considering the design effect of 1.5 (due to random cluster sampling), 1500 individuals were required to complete the survey.

2.3 Participants

All married women of reproductive age (15 to 49 years old) registered in urban or rural comprehensive health centers of Qazvin province were eligible for inclusion in the study. Lack of consent to participate in the study was the only exclusion criterion. In the present study, 1571 married women of reproductive age participated and completed the survey.

2.4 Sampling procedure

A multi-stage proportional sampling process was utilized to recruit participants. First, the five main cities of Qazvin province (Qazvin, Takestan, Abyek, Buin Zahra, Alborz, and Avaj) were considered as main clusters. In each cluster, the required sample size was assigned based on city population size. Moreover, the required number of urban and rural participants were estimated based on the proportion of rural to urban population in each of the main cities. In the next stage, the number of urban and rural comprehensive health centers in each city was acquired and the required sample size for each comprehensive health center was estimated. Then the list of married reproductive age women registered in each center was prepared and based on random sampling method, the required number were selected.

2.5 Data collection process

The survey was completed electronically and hosted on the *Porsline* online platform. The selected individuals were initially contacted by telephone based on the prepared lists, and the study's aims and their voluntary participation were explained to them. If they provided informed consent to participate, the link was then sent to them. The link to access the survey was made available to the selected participants (based on aforementioned process) via SMS and social networking platforms. Internet penetration is high in Iran. Based on Iran's Regulatory Organization and Radio Communications' report, by 2022, 89% of Iranian people were internet users. Qazvin is one of central provinces in Iran with good infrastructures including internet in both rural and urban areas. Internet access in different urban and rural

area was checked with healthcare providers before starting the data collection. Consequently, the research team were assured that a considerable proportion of eligible population in both rural and urban area had internet access and that online data collection was feasible. The survey link was deactivated once the estimated sample size had been reached.

2.6 Variables and measures

A self- devised questionnaire with three section was prepared based on study aims, literature review and expert opinion, as below:

1. *Checklist of demographic and fertility information* including fifteen items (details reported in Table 1)
2. *Reasons for Choosing Abortion Scale (RCAS)*. In order to develop the RCAS, a list of 37 reasons for the abortion was prepared based on literature review and expert panel (including an obstetrician, a reproductive health specialist, an epidemiologist, a general practitioner, and a representative from provincial maternal health services). Participants were asked to indicate (yes/no) whether any of the 37 reasons were a reason for choosing the abortion or not. Participants could choose more than one response. A score of '1' was given for a yes answer and a score of '0' was given for a no answer. For the RCAS, there were participants who did not choose any of items as reason for choosing abortion. Moreover, there was one open-ended question after all of the items asking participants to write any other possible reasons which might make them choose to have an abortion. However, no participants answered this question. The participants were divided into two groups based on the answer to this question: the group that did not choose any of the reasons for abortion were given a total score of '0'; and the second group was individuals who chose at least one reason for abortion. Principal components analysis (PCA) was used to identify the most important possible reasons for choosing abortion (among the 37 initial items). The conditions of using PCA were checked and confirmed (KMO=0.92, Bartlett's test of sphericity <0.001). To calculate the total score on this scale, the average sum of each item is calculated (i.e., a number between 0 and 3). Scores range from 0 to 39, and higher scores indicate more reasons to choose abortion. The reliability of the scale with 13 items was very good (Cronbach's alpha = 0.879). Further information on the factor analysis and the development of the final version of the RCAS are in the 'Results' section.
3. *Attitudes Towards Abortion Scale (ATAS)*. In order to develop the ATAS, a list of 25 items was generated according to cultural and social conditions and common attitudes in Iran on the basis of a literature review and the aforementioned expert panel. An exploratory factor analysis (EFA) using a PCA approach along with the optional variable of abortion type were used to evaluate the validity of the construct. The conditions of using PCA were checked and confirmed (KMO=0.87, Bartlett's test of sphericity <0.001). The items are rated on a five-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*) to. To calculate the total score, the average sum of each subscale is calculated (ranging from 4 to 20). Higher scores indicate higher pro-abortion attitudes. The reliability of the 25-item scale was very good (Cronbach's alpha=0.893). Further information on the factor analysis and the development of the final version of the ATAS are in the 'Results' section.

Face validity and content validity of all items were carried out qualitatively and modifications to the items were performed prior to data collection. For face validity, ten reproductive age women were asked to assess the questionnaire's items in terms of relevance, difficulty, and ambiguity (qualitative face validity). Ten specialists in the field of reproductive health, midwifery, and nursing assessed the questionnaire in terms of grammar, wording, and item allocation (qualitative content validity).

2.7 Statistical analysis

Data were analyzed using SPSS version 25. Descriptive analysis was carried out to report frequencies and percentages of categorical data, and means and standard deviations of continuous data. Univariable and multivariable binary logistic regression models were applied to investigate the association between history of abortion, history of abortion in the past year, number of abortions, and type of abortion (spontaneous and non-spontaneous) with demographic and social variables, mental health, reasons for choosing abortion, and attitude towards abortion. In the logistic regression method, the response variables were history of abortion, history of abortion in the past year, number of abortions, and type of abortion (spontaneous and non-spontaneous). In carrying out the analysis, categorical variables were defined as dummy variables.

Table 1 Demographic characteristics of the participants (N = 1571)

Variable	Total sample: No (%)		Having abortion history (n = 1571)		Having abortion in past year (n = 292)		More than one abortion (n = 292)		Having non-spontaneous abortion (n = 292)	
	No (%)	OR (p)	No (%)	OR (p)	No (%)	OR (p)	No (%)	OR (p)	No (%)	OR (p)
Age	Younger than 35 years	941 (59.9)	148 (15.7)	1	38 (58.5)	1	32 (41.6)	1	96 (50.5)	1
	35 years and older	630 (40.1)	144 (22.9)	1.59 (<0.001)	27 (41.5)	0.67 (0.16)	45 (58.4)	1.65 (0.06)	94 (49.5)	1.02 (0.94)
Marriage duration	Up to five years	378 (24.8)	38 (10.1)	1	17 (26.2)	1	6 (7.9)	1	96 (50.5)	1
	More than five years	1145 (75.2)	251 (21.9)	2.51 (<0.001)	48 (73.8)	0.29 (<0.001)	70 (92.1)	2.06 (0.12)	94 (49.5)	0.96 (0.92)
Education	Primary school	131 (8.3)	23 (17.6)	1	5 (7.7)	1	5 (6.5)	1	14 (7.4)	1
	Guidance school	265 (16.9)	56 (21.1)	1.26 (0.40)	14 (21.5)	1.20 (0.76)	10 (13)	0.78 (0.69)	36 (18.9)	1.16 (0.78)
	High school diploma	561 (35.7)	109 (19.4)	1.13 (0.62)	22 (33.8)	0.91 (0.87)	35 (45.5)	1.70 (0.33)	74 (38.9)	1.34 (0.52)
	University	614 (39.1)	104 (16.9)	0.96 (0.86)	24 (36.9)	1.08 (0.89)	27 (35.1)	1.26 (0.67)	66 (34.7)	1.12 (0.82)
Spouse education	Primary school	162 (10.3)	28 (17.3)	1	5 (7.7)	1	6 (7.9)	1	17 (9.0)	1
	Guidance school	304 (19.4)	65 (21.4)	1.30 (0.29)	16 (24.6)	1.50 (0.48)	18 (23.7)	1.40 (0.53)	42 (22.3)	1.18 (0.72)
	High school diploma	546 (34.8)	98 (17.9)	1.05 (0.85)	25 (38.5)	1.58 (0.40)	23 (30.3)	1.12 (0.82)	67 (35.6)	1.40 (0.45)
Job	Academic	511 (32.5)	98 (19.2)	1.14 (0.59)	19 (29.2)	1.11 (0.86)	29 (38.2)	1.54 (0.40)	62 (33.0)	1.11 (0.81)
	Housewife	1053 (67.0)	205 (19.5)	1	48 (73.8)	1	52 (67.5)	1	131 (68.9)	1
	Employed	518 (33.0)	87 (16.8)	0.84 (0.20)	17 (26.2)	0.79 (0.47)	25 (32.5)	1.19 (0.55)	59 (31.1)	1.19 (0.52)
	unemployed	80 (5.1)	11 (13.8)	1	2 (3.1)	1	3 (3.9)	1	7 (3.7)	1
Spouse job	Employed	322 (20.5)	60 (18.6)	1.44 (0.31)	13 (20.0)	1.25 (0.89)	23 (29.9)	1.66 (0.49)	44 (23.2)	1.57 (0.51)
	Worker	402 (25.6)	63 (15.7)	1.17 (0.66)	17 (26.2)	1.66 (0.54)	14 (18.2)	0.76 (0.71)	42 (22.1)	1.14 (0.85)
	Non-governmental	720 (45.8)	144 (20.0)	1.58 (0.18)	32 (49.2)	1.29 (0.76)	33 (42.9)	0.79 (0.74)	88 (46.3)	0.90 (0.87)
Retired	47 (3.0)	14 (29.8)	2.66 (0.03)	1 (1.5)	0.35 (0.41)	4 (5.2)	1.07 (0.94)	9 (4.7)	1.03 (0.97)	

Table 1 (continued)

Variable	Total sample: No (%)		Having abortion history (n = 1571)		Having abortion in past year (n = 292)		More than one abortion (n = 292)		Having non-spontaneous abortion (n = 292)	
	No (%)	OR (p)	No (%)	OR (p)	No (%)	OR (p)	No (%)	OR (p)	No (%)	OR (p)
Place of residency	Rural	523 (33.3)	109 (20.8)	1	27 (41.5)	1	20 (26.0)	1	74 (38.9)	1
	Urban	1048 (66.7)	183 (17.5)	0.80 (0.11)	38 (58.5)	0.80 (0.43)	57 (74.0)	2.01 (0.02)	116 (61.1)	0.82 (0.44)
City	Qazvin	690 (43.9)	144 (20.9)	1	31 (47.7)	1	39 (50.6)	1	90 (47.4)	1
	Booien Zahra	227 (14.4)	38 (16.7)	0.76 (0.18)	12 (18.5)	1.68 (0.20)	11 (14.3)	1.10 (0.82)	28 (14.7)	1.68 (0.20)
	Avaj	59 (3.8)	7 (11.9)	0.51 (0.10)	2 (3.1)	1.46 (0.66)	3 (3.9)	2.02 (0.37)	5 (2.6)	1.50 (0.64)
	Takestan	217 (13.8)	49 (22.6)	1.11 (0.59)	9 (13.8)	0.82 (0.64)	9 (11.7)	0.61 (0.23)	30 (15.8)	0.95 (0.87)
	Abyek	85 (5.4)	15 (17.6)	0.81 (0.49)	3 (4.6)	0.91 (0.89)	4 (5.2)	0.98 (0.97)	8 (4.2)	0.69 (0.49)
	Alborz	293 (18.7)	39 (13.3)	0.58 (0.006)	8 (12.3)	0.94 (0.89)	11 (14.3)	1.06 (0.89)	29 (15.3)	1.74 (0.17)
Independent life status	No	183 (11.6)	37 (20.2)	1	11 (16.9)	1	12 (15.8)	1	24 (12.8)	1
	Yes	1340 (85.3)	252 (18.8)	0.91 (0.65)	54 (83.1)	0.65 (0.26)	64 (84.2)	0.71 (0.37)	164 (87.2)	1.01 (0.98)
Infertility history	No	1423 (90.6)	256 (18.0)	1	60 (92.3)	1	59 (77.6)	1	167 (88.8)	1
	Yes	100 (6.4)	33 (33.0)	2.25 (<0.001)	5 (7.7)	0.58 (0.29)	17 (22.4)	3.55 (<0.001)	21 (11.2)	0.93 (0.86)
Mental health status	Good mental health	916 (58.3)	155 (16.9)	1	30 (46.2)	1	38 (49.4)	1	91 (47.9)	1
	Poor mental health	655 (41.7)	137 (20.9)	1.30 (0.05)	35 (53.8)	1.43 (0.20)	39 (50.6)	1.23 (0.45)	99 (52.1)	1.83 (0.02)
Number of children	0	214 (13.6)	28 (9.7)	1	15 (23.1)	1	8 (10.5)	1	19 (10.1)	1
	1	494 (31.4)	89 (30.8)	1.46 (0.11)	20 (30.8)	0.25 (0.002)	20 (26.3)	0.73 (0.51)	59 (31.4)	0.93 (0.88)
	2	603 (38.4)	125 (43.3)	1.74 (0.02)	25 (38.5)	0.21 (0.001)	38 (50.0)	1.09 (0.85)	87 (46.3)	1.08 (0.86)
	≥ 3	212 (13.5)	47 (16.3)	1.89 (0.02)	5 (7.7)	0.10 (<.001)	10 (13.2)	0.68 (0.48)	23 (12.2)	0.45 (0.11)

Table 1 (continued)

Variable	Total sample: No (%)		Having abortion history (n = 1571)		Having abortion in past year (n = 292)		More than one abortion (n = 292)		Having non-spontaneous abortion (n = 292)	
	No (%)	OR (p)	No (%)	OR (p)	No (%)	OR (p)	No (%)	OR (p)	No (%)	OR (p)
Access to healthcare providers (Mean (SD) on 1-5likert scale)	4.08 (0.79)	4.02 (0.86)	0.88 (0.11)	0.75 (0.07)	3.85 (0.91)	0.88 (0.41)	3.85 (0.91)	0.88 (0.41)	4.0 (0.82)	0.94 (0.64)
	Midwife									
	GP	4.13 (0.75)	4.08 (0.77)	0.91 (0.25)	0.89 (0.36)	3.95 (0.74)	0.83 (0.28)	3.95 (0.74)	0.83 (0.28)	4.03 (0.75)
Obstetrician	3.59 (1.03)	3.51 (1.06)	0.91 (0.13)	0.76 (0.13)	3.40 (1.10)	0.84 (0.17)	3.40 (1.10)	0.84 (0.17)	3.44 (1.04)	0.84 (0.15)

First, the association between response variables and demographic and social variables, mental health, RCAS scores, and ATAS scores were investigated using univariable models. Then, variables with a significance level of less than 0.2 in univariable models were entered into multivariable model. In the multivariable logistic regression method, independent variables were entered into the model using a backward stepwise approach. The significance level of other tests was $p < 0.05$.

2.8 Ethics

The study protocol was reviewed and approved by the institutional review board and the ethics committee affiliated to Qazvin University of Medical Sciences (Decree code: IR.QUMS.REC.1401.281). All required permissions were obtained. Informed consent was provided by all participants. Prior to the study, information regarding the research objectives were explained, participation was voluntary, and participants were assured that all data collected would be confidential and anonymous.

3 Results

3.1 Abortion profile

The lifetime prevalence of abortion was 18.6% among the total sample (292 out of 1571). For approximately three-quarters of the women (73.6%), it was their first experience of abortion (215 out of 292). The prevalence of non-spontaneous abortion was 65.1% among those who reported having had an abortion (190 out of 292), and 69.2% of overall abortions in the past year ($n=65$) were non-spontaneous ($n=45$). The prevalence of abortion in the past year among those who reported having had an abortion was 22.3%. The demographic and fertility characteristics of the participants and its relationship with history of abortion, history of abortion in the past year, number of abortions, and non-spontaneous abortions (results of univariable logistic regression analysis) are shown in Table 1.

3.2 Reasons for abortion

In the PCA, RCAS items with a loading factor less than 0.4, and items loading on two subscales with a factor load difference of less than 0.2 were removed. This process resulted in the RCAS comprising 13 items and three subscales, which explained 56.28% of the variance. The first subscale labelled 'Couple's behavior, health and relationship problems' (e.g., mother's and/or spouse's self-reported smoking and addiction to drugs, mother's and/or spouse's physical diseases and/or psychological problems, sexual infidelity, decision to divorce and unstable marital relationships) explained 27% of the variance. The second sub-scale was labelled 'fertility-related stressful experiences' (e.g., difficult experience of previous childbirth, difficult experience of previous pregnancy, worrying about their own health during childbirth) explained 15% of the variance. The third sub-scale was labelled 'family economic situations' (e.g., poor economic situation, spouse's unemployment) and explained 14% of the variance. The correlation between the subscales was moderate (between 0.39 and 0.57).

3.3 Attitude toward abortion

In the PCA, 18 ATAS items remained in four subscales, explaining 62.88% of the variance. The first subscale was labelled 'pro-abortion attitude' (e.g., abortion should be for couples who do not currently want children; abortion should be for unwanted pregnancies that interfere with occupational and/or educational circumstances; abortion is an appropriate method to control the number of children [family planning]; women have the right to abortion freely; abortion should be cheap and widely available; abortion should be carried out in the first trimester of pregnancy; abortion should be freely provided for women who think they do not have the ability to care for the child; abortion should be carried out if there is a threat to married life [due to marital disputes]; abortion should be freely provided for pregnant women who are not married), and explained 26.33% of the variance.

The second sub-scale was labelled 'abortion in controlled conditions' (e.g., government institutions must strictly control abortion; abortion must be for in those who have been raped; abortion must be for those whose pregnancy is dangerous

for their health; abortion should be performed when fetuses are suspected of mental or physical abnormality) and explained 13.66% of the variance.

The third subscale labelled 'abortion in cases of suspected fetal damage' (e.g., 'If I have taken medicine with probable fetal side effects before knowing I am pregnant, I should have the right to have an abortion'; 'If the fetal heart activity is not seen in the ultrasound assessment, abortion should be allowed') and explained 13.64% of the variance.

The fourth subscale was labelled 'couple interaction for fertility decisions' (e.g., the husband must have a role in deciding whether to have an abortion; abortion should be allowed if the pregnancy was unplanned) and explained 9.25% of the variance. The correlation between the subscales was moderate (between 0.24 and 0.58).

3.4 Association of abortion profile with participants' ATAS and RCAS scores

A total of 672 participants declared that they did not consider any of the items as a reason for abortion (42.8%). Univariable regression analysis showed that in the group that chose a reason for abortion compared to the group that did not choose any of the reasons for abortion, the likelihood of abortion was three times higher ($p < 0.001$), the likelihood of abortion in the past year was 84% higher ($p = 0.10$), and the likelihood of non-spontaneous abortion was 72% higher ($p = 0.05$). No significant association was observed between the likelihood of abortion more than once and choosing the reason for abortion ($p = 0.92$). The RCAS total score was significantly associated with lifetime abortion prevalence ($p < 0.001$), i.e., higher scores were associated with greater frequency of abortion. However, RCAS total score was not significantly associated with experience of abortion in the past year ($p = 0.44$), having non-spontaneous abortion ($p = 0.88$), or having more than one abortion ($p = 0.67$). The likelihood of abortion and non-spontaneous abortion increased by 6% ($p = 0.04$) and 10% ($p = 0.3$) respectively with increasing mean scores on the ATAS. There was no significant association between ATAS score and history of abortion in the past year ($p = 0.96$) or having more than one abortion ($p = 0.62$).

3.5 Predictors of abortion

The results of the multivariable logistic regression model (Table 2) showed that the likelihood of abortion was significantly higher among women aged 35 years and over than among women aged under 35 years (OR = 40%), among women married for more than five years compared to those married for five years or fewer (OR = 2.3), and among women with infertility history (OR = 2.12). The likelihood of abortion was 2.9 times higher among women who chose a reason for abortion than those who did not choose any of the reasons for abortion. Moreover, the likelihood of abortion increased by 7% with each unit increase in the mean score on the attitude towards abortion scale. Likelihood of abortion was 37% lower in Alborz city than in Qazvin city (no significant difference between other cities with Qazvin as reference group).

Predictors of abortion in the past year were number of children (higher abortion among those with fewer children) and selecting a reason for abortion. Predictors of having more than one abortion were living in urban areas and having history of infertility. Predictors of non-spontaneous abortion were having three or more children, having poor mental health status, choosing a reason for abortion, and having higher scores on the ATAS.

4 Discussion

The present study was designed to determine the: (i) prevalence of abortion among married women of reproductive age in the province, (ii) attitude of married women of reproductive age in the province towards abortion, and (iii) reasons for choosing abortion by married women of reproductive age in the province.

The results of the study showed that the lifetime prevalence of abortion was 18.6%, and the past-year prevalence of abortion was 22.3%. The prevalence of non-spontaneous abortion was 65.1% of overall the lifetime abortions and 69.2% of overall abortions in the past year. The lifetime prevalence of abortion is similar to the prevalence of 18.8% in a previous Iranian study, [28] and similar to rates of induced abortion between 8% and 17% in other Iranian studies [29–31]. Different prevalence rates of abortion have been reported in other countries including 19% in Peru [32], 16.7% in China [33], and between 7% [34] and 21% [35] in the United States. The global estimate of abortion was 30% of all pregnancies between 2015 and 2019, and approximately 61% of unintended pregnancies, ended in induced abortion [14, 16]. Therefore, lifetime prevalence of abortion in present study is in line with studies from the same country but lower than global estimates. This inconsistency with global estimates might be due to reasons such as the stronger perceived social

Table 2 Results of multi-variable logistic regression for identifying independent predictors of abortion

Dependent variable	Predictors	Odds ratio (OR)	95% C.I. OR	Sig.	Variance explained
Abortion history	Choosing reason for abortion vs. having no reason	2.87	2.13; 3.88	< 0.001	11.5%
	Marriage duration more than five years vs. up to five years	2.29	1.55; 3.38	< 0.001	
	Having infertility history	2.12	1.34; 3.36	0.001	
	35 years and more vs. less than 35 years	1.40	1.06; 1.85	0.019	
	Attitude toward abortion	1.07	1.02; 1.13	0.009	
	Alborz city vs. Qazvin city as reference group *	0.63	0.43; 0.91	0.015	
Having abortion in past year	Choosing no reason for abortion vs. having a reason for abortion	1.95	0.91; 4.17	0.08	10.6%
	Number of children	1	-	-	
		0			
		1	0.10; 0.62	0.003	
		2	0.09; 0.51	0.001	
More than one abortion		0.10	0.03; 0.33	< 0.001	7.8%
	City vs. rural	1.93	1.07; 3.49	0.03	
	Having infertility history	3.55	1.67; 7.52	0.001	
Having non-spontaneous abortion	Choosing a reason for abortion vs. having no reason	1.77	1.00; 3.15	0.05	8.1%
	Poor vs. good mental health	1.74	1.05; 2.89	0.03	
	Attitude toward abortion	1.09	0.99; 1.20	0.09	
	Number of children ≥ 3 (vs. no child)	0.53	0.28; 1.03	0.06	

*No significant difference between other cities with Qazvin as reference group

stigma regarding induced abortion in Iran and participation of only married women in present study (because sex before marriage is culturally unacceptable in Iran, therefore the present study did not investigate all women of reproductive age).

The results of present study showed that women's reasons for choosing abortion fell into one of three main clusters: (i) couple's behavior, health and relationship problems, (ii) fertility-related stressful experiences, and (iii) family economic situations. Each of these reasons have been separately reported in previous studies but no previous study has ever assessed all the reasons simultaneously (or using a psychometric scale which was specifically developed for the present study). For example, previous studies have reported that reasons for abortions include already having sufficient number of current children and being in an unfavorable economic situation [29] which concur with those of the present study. Specific demographic factors have also been reported as having higher associations with those having an abortion in previous studies such as higher education status among women and being an employed woman (because more highly educated women tend to have better paid jobs and having a baby may impede career progression), and living in a slum (because they do not want to bring up a baby in poor living conditions) [30]. A recent study which synthesized the reasons why women from 14 countries have induced abortions reported that the most frequent reasons for having an abortion were socioeconomic concerns or to limit the number of children being raised. With a few exceptions, little variation existed in women's socio-demographic characteristics (e.g., women's age, marital status, educational attainment, and residence). Data from Sweden and the US has shown that women often have more than one reason for having an abortion. Overall, it was concluded that personal, cultural, economic, social and familial factors were related to abortion choice at country level and that future research should examine these factors in greater depth [13]. The present study attempted to assess these reasons in an Iranian context and items related to couple's health and relationships problems had the highest variance in explaining the reasons to choose abortion.

As well as the predicting role of attitude towards abortion and having reasons to choose abortion, some predictors were identified which increased the likelihood of abortion including being over 35 years, being married for over five years, having a history of infertility, living in rural areas, and having poor mental health status. Contrasting findings have been reported in previous studies regarding the association between age and abortion rate. In some studies, higher abortion rates have been reported among older age group [36–38], while other studies have reported higher rates of abortion among younger age groups [39–42]. This inconsistency might be due to the cultural difference and different study populations in these studies. In the present study, women with a history of infertility had a higher rate of more than one abortion, which is consistent with the previous studies [24, 43]. Women with a history of infertility are a high-risk of group for recurrent abortion and should be appropriately monitored [44].

Another predictor of abortion in present study was the number of children. Women with three or more children were less likely to have an abortion than childless women. A previous study by Jones et al. noted that in 2014, most abortions occurred among women who had already given birth. In the US, the abortion rate among women with only one previous birth has been reported to be 22.0 per 1000, among women with more than one previous birth 13.2 per 1000, and among women who have not given birth 13.0 per 1000 [45]. A study conducted in Ghana also reported that the prevalence of abortion was lower among women with an increasing number of children [38]. In an Iranian study, the results showed that the lifetime prevalence of abortion among mothers without children or with one child was higher than the lifetime prevalence of abortion in the present study [27]. In the present study, individuals without children had a greater likelihood of having an abortion and can be considered as a group at-risk of abortion (given that in Iran, abortions are not culturally acceptable and policies have been introduced to prevent abortions).

In the present study, the likelihood of non-spontaneous abortion was higher among women with poor mental health status than among women with favorable mental health status. Due to cross-sectional nature of present study, the direction of association cannot be determined. It is unknown whether poor mental health is consequence of a previous abortion or was a reason which led to abortion. It has been reported that the risk of mental health problems after abortion is moderate to very high [46]. However, there is no evidence that abortion has therapeutic effects in reducing mental health risks caused by unwanted or unintended pregnancy. There is evidence that having an abortion may be associated with a small to moderate increase in the risk of some mental health problems [47]. Therefore, longitudinal studies are needed to identify the effect of poor mental health on occurrence of non-spontaneous abortion.

4.1 Limitations

The present study benefits from a large sample size with participants from different parts of province which reflected the variability of cultural and social factors. Moreover, a multi-variable regression analysis led to the identification of the most important predictors in each variable of interest. However, some limitations should be considered when

interpreting the findings. First, (as aforementioned) the cross-sectional nature of the study meant that establishing causality between the variables could be determined. Second, the use of self-report measures to investigate the experience, attitudes and reasons to choose abortion are sensitive topics and could a source of underreporting due to perceived social stigma regarding these issues (i.e., due to social desirability). Third, sampling was conducted from one province of Iran which limits generalizability of findings to other parts of Iran. Fourth, the selected participants were only married women and the results cannot be generalized to single women who have had sexual relations and experienced abortion.

5 Conclusion and clinical implication

The results of present study can be used in clinical practice for designing strategic plans to reduce non-spontaneous abortion. Women's reasons for choosing abortion fell into one of three main clusters of (i) couple's behavior, health and relationship problems, (ii) fertility-related stressful experiences, and (iii) family economic situations. The other findings of present study were identification of predictors for non-spontaneous abortion. Women in high-risk groups for non-spontaneous abortion (i.e., those aged over 35 years, those married for more than five years, those with an infertility history, those with a lower number of children, those living in rural areas, and those having poor mental health status) should be assessed by primary healthcare services during preconception and have early prenatal counseling to help in decisions regarding abortion. First, healthcare providers should be informed regarding the main reasons to choose abortion and high-risk groups for non-spontaneous abortion via in-service empowerment training workshop. In next step it is suggested that healthcare providers who visit reproductive age women for preconception and early prenatal counselling, assess these aspects as the main factors that increase the probability of women choosing to have an abortion. Also, some of healthcare providers in obstetric field can be trained specifically for counselling with high risk pregnant women (who decide to abort their fetus) to maintain pregnancy and avoid abortion. Further research can be designed to implement and assess the effectiveness of the aforementioned suggested strategies to identify the best clinical practice.

Acknowledgements We would like to thank all the pregnant women who participated in the study.

Author contributions Z.A. and N.Y. contributed to the conception, Z.A., M.A. and N.Y. contributed to the design of the study, N.Y. and M.A. contributed in data collection in supervision of M.A. Z.A. and M.A. contributed in data analysing and interpretation of data. Z.A. and M.A. drafted the manuscript. M.D.G. provided contributions to the literature review and discussion and prepared the final version of the manuscript. M.D.G. revised the manuscript and copy-edited the manuscript. All authors revised the manuscript, agreed to be fully accountable for ensuring the integrity and accuracy of the study, and read and approved the final version of the manuscript to be published. All the authors met the criteria for authorship, and they are listed as co-authors on the title page.

Funding No financial support received.

Data availability The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate In present study, the Declaration of Helsinki was adhered and study protocol was approved by the ethics committee affiliated to Qazvin University of Medical Sciences, Qazvin, Iran (approval number: IR.QUMS.REC.1401.281). After obtaining the necessary permits, the individuals were invited to participate in the research, and informed consent was obtained from all participants.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

Open Access This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. Kazempour S, Afsaneh I, Sadegh VH. Social factors affecting fertility in the family (case study: married students of Islamic Azad University, North Tehran Branch). *Sociol Rev*. 2011;2(5):57–75.
2. Chen M, Sui Y, Liu W, Liu H, Huang Y. Urbanization patterns and poverty reduction: a new perspective to explore the countries along the Belt and Road. *Habitat Int*. 2019;84:1–14.
3. Roudi F, Azadi P, Mesgaran M. Iran's population dynamics and demographic window of opportunity. Domestic Economy. Working Paper 4, Stanford Iran 2040 Project, Stanford University, October 2017
4. Abbasi Shavazi MJ, Khajehsahlehi Z. An assessment on the impact of women's autonomy, education and social participation on child-bearing intention in Sirjan city. *Woman Dev Politics (Women's Research)*. 2013;11(1):45–64.
5. Statistical Center of Iran, Presidency of I.R.I. Plan and Budget Organization. Iran's total fertility rate Tehran, Iran, 2021. https://amar.org.ir/Portals/0/Files/baravord/Mizan_Barvari_Kol_1396-1400_V2.pdf?ver=4aMozJjN891K9VycxdVVZA%3d%3d.
6. Fathi E. The phenomenon of population aging in Iran. *Iran J Off Stat Stud*. 2020;30(2):387–413.
7. Stonawski M, Skirbekk V, Hackett C, Potančoková M, Connor P, Grim B. Global population projections by religion: 2010–2050. *Yearbook of international religious demography 2015*: Brill; 2015. p. 99–116.
8. Kalantari S, Abbaszadeh M, Aminmozafari F, Rakeibonab N. The sociological study of attitude to child bearing and it's some related factors (case study: married youth in Tabriz city). *J Appl Sociol*. 2010;21(1):83–104.
9. Tavousi M, Haerimehrizi A, Sadighi J, Motlagh ME, Eslami M, Naghizadeh F, et al. Fertility desire among Iranians: a nationwide study. *Payesh*. 2017;6(4):401–10.
10. Ishola F, Ukah UV, Alli BY, Nandi A. Impact of abortion law reforms on health services and health outcomes in low-and middle-income countries: a systematic review. *Health Policy Plan*. 2021;36(9):1483–98.
11. Lindberg L, Kost K, Maddow-Zimet I, Desai S, Zolna M. Abortion reporting in the United States: an assessment of three national fertility surveys. *Demography*. 2020;57(3):899–925.
12. Alves C, Jenkins SM, Rapp A. Early pregnancy loss (spontaneous abortion): StatPearls Publishing, Treasure Island (FL); 2023.
13. Chae S, Desai S, Crowell M, Sedgh G. Reasons why women have induced abortions: a synthesis of findings from 14 countries. *Contraception*. 2017;96(4):233–41.
14. Bearak J, Popinchalk A, Ganatra B, Moller A-B, Tunçalp Ö, Beavin C, et al. Unintended pregnancy and abortion by income, region, and the legal status of abortion: estimates from a comprehensive model for 1990–2019. *Lancet Glob Health*. 2020;8(9):e1152–61.
15. Ganatra B, Gerdtts C, Rossier C, Johnson BR, Tunçalp Ö, Assifi A, et al. Global, regional, and subregional classification of abortions by safety, 2010–14: estimates from a Bayesian hierarchical model. *The Lancet*. 2017;390(10110):2372–81.
16. Singh S, Remez L, Sedgh G, Kwok L, Onda T. Abortion worldwide 2017: uneven progress and unequal access. 2018. Guttmacher Institute. https://www.guttmacher.org/sites/default/files/report_pdf/abortion-worldwide-2017.pdf.
17. Engelbert Bain L, Zweekhorst MB, Amoakoh-Coleman M, Muftugil-Yalcin S, Omolade AIO, Becquet R, et al. To keep or not to keep? Decision making in adolescent pregnancies in Jamestown, Ghana. *PLoS ONE*. 2019;14(9):e0221789.
18. Hajri S, Raifman S, Gerdtts C, Baum S, Foster DG. 'This is real misery': Experiences of women denied legal abortion in Tunisia. *PLoS ONE*. 2015;10(12): e0145338.
19. Jayaweera RT, Ngui FM, Hall KS, Gerdtts C. Women's experiences with unplanned pregnancy and abortion in Kenya: a qualitative study. *PLoS ONE*. 2018;13(1): e0191412.
20. Sundari Ravindran T, Balasubramanian P. "Yes" to abortion but "no" to sexual rights: the paradoxical reality of married women in rural Tamil Nadu. *India Reprod Health Matters*. 2004;12(23):88–99.
21. Chinichian M, Holakoic Nainie K, Rafeia Shirpak Kh. Voluntary abortion in Iran: a qualitative study. *Payesh (Health Monitor) J*. 2007;6(3):219–232.
22. Shamshiri-Milani H. Mother's rights to life, a medical approach to abortion. *J Reprod Infertil*. 2005;6(4):457–64.
23. Ladiier-Fouladi M. The Islamic Republic of Iran's new population policy and recent changes in fertility. *Iran Stud*. 2021;54(5–6):907–30.
24. Mohammadi M, Shirazi SRS, Derogar P, Dadashi A, Mohammadi S, Moharrami T. Evaluation of factors involved in recurrent miscarriages. *Sarem J Med Res*. 2021;6(3):185–98.
25. Khalaj-Abadi-Faraahani F, Sadat-Hashemi S. Factors influencing unwanted pregnancies in Tehran. *Ha im*. 2002;5(3):201–6.
26. Alijanzadeh M, Lin C-Y, Yahaghi R, Rahmani J, Yazdi N, Jafari E, et al. Measurement invariance and differential item functioning of the Health Literacy Instrument for Adults (HELIA): a large-scale cross-sectional study in Iran. *Healthcare*. 2022;10(10):2064.
27. Alijanzadeh M, Bahrami N, Jafari E, Noori M, Miri F, Joftyar M, et al. Iranian women's attitude toward childbearing and its' association with generalized trust, social support, marital satisfaction and governmental childbearing incentives. *Heliyon*. 2023;9(5): e16162.
28. Salimi Y, Mansournia M, Abdollahpour I, Nedjat S. Lifetime prevalence of abortion in 15–50 year-old females in Tehran and its predictors; a population-based cross-sectional study. *Iran J Epidemiol*. 2021;17(3):243–336.
29. Motavalli R, Alizadeh L, Shahbazzadegan S. Evaluation of the prevalence, reasons and consequences of induced abortion in women of Ardabil in 2011. *J Ardabil Univ Med Sci*. 2012;12(4):384–91.
30. Erfani A, Shojaei J. New evidence on induced abortion in Tehran, Iran: rates, causes, and changes. *Iran J Obstet Gynecol Infertil*. 2018;21(3):64–77.
31. Ranji A. Induced abortion in Iran: prevalence, reasons, and consequences. *J Midwifery Women's Health*. 2012;57(5):482–8.
32. Juárez-Chávez E, Ruiz JHV, Navarro RMC, Vásquez RG, Alvarado SIC. Exploring the prevalence of abortion and its characteristics in Perú. *Contraception*. 2023;126: 110115.
33. Kang L, Liu J, Ma Q, Jing W, Wu Y, Zhang S, et al. Prevalence of induced abortion among Chinese women aged 18–49 years: findings from three cross-sectional studies. *Front Public Health*. 2022;10: 926246.
34. Ralph L, Foster DG, Raifman S, Biggs MA, Samari G, Upadhyay U, et al. Prevalence of self-managed abortion among women of reproductive age in the United States. *JAMA Netw Open*. 2020;3(12):e2029245.

35. Kissling A, Jackson HM. Estimating prevalence of abortion using list experiments: findings from a survey of women in Delaware and Maryland. *Womens Health Issues*. 2022;32(1):33–40.
36. Gao GP, Zhang RJ, Zhang XJ, Jia XM, Li XD, Li X, et al. Prevalence and associated factors of induced abortion among rural married women: a cross-sectional survey in Anhui, China. *J Obstet Gynaecol Res*. 2015;41(3):383–91.
37. Mote CV, Otupiri E, Hindin MJ. Factors associated with induced abortion among women in Hohoe. *Ghana African Journal of Reproductive Health*. 2010;14(4):115–23.
38. Sundaram A, Juarez F, Bankole A, Singh S. Factors associated with abortion-seeking and obtaining a safe abortion in Ghana. *Stud Fam Plann*. 2012;43(4):273–86.
39. Ilboudo PG, Somda SM, Sundby J. Key determinants of induced abortion in women seeking postabortion care in hospital facilities in Ouagadougou, Burkina Faso. *Int J Women's Health*. 2014;6:565–72.
40. Basnett I, Sharma SK, Bhusal CL, Parajuli RR, Anderson KL. Increasing access to safe abortion services through auxiliary nurse midwives trained as skilled birth attendants. *Kathmandu Univ Med J*. 2011;9(36):260–6.
41. Maina BW, Mutua MM, Sidze EM. Factors associated with repeat induced abortion in Kenya. *BMC Public Health*. 2015;15:1048.
42. Kortsmit K, Nguyen AT, Mandel MG, Clark E, Hollier LM, Rodenhizer J, et al. Abortion surveillance—United States, 2020. *MMWR Surveill Summ*. 2022;71(10):1.
43. Pike GK. Abortion and infertility. *Issues Law Med*. 2020;35(2):173–95.
44. Pourakbari R, Ahmadi H, Yousefi M, Aghebati-Maleki L. Cell therapy in female infertility-related diseases: Emphasis on recurrent miscarriage and repeated implantation failure. *Life Sci*. 2020;258: 118181.
45. Jones RK, Jerman J. Population group abortion rates and lifetime incidence of abortion: United States, 2008–2014. *Am J Public Health*. 2022;112(9):1284–96.
46. Coleman PK. Abortion and mental health: quantitative synthesis and analysis of research published 1995–2009. *Br J Psychiatry*. 2018;199(3):180–6.
47. Fergusson DM, Horwood LJ, Boden JM. Does abortion reduce the mental health risks of unwanted or unintended pregnancy? A re-appraisal of the evidence. *Aust N Z J Psychiatry*. 2013;47(9):819–27.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.