

Meta-Analysis

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Abortion prevalence and its related factors in Iran: A systematic review and meta-analysis

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ABSTRACT

Objective: To estimate the pooled prevalence rate of different types of abortion and the most important related factors of abortion in Iran based on a systematic review and meta-analysis.

Methods: This systematic review and meta-analysis was conducted on the Iranian studies during the February 1, 2012 to December 31, 2024. Abortion prevalence and its influencing factors were evaluated. Relevant keywords were used to find eligible studies in Web of Science, PubMed, Google Scholar, Scopus, Science-Direct and SID databases. Due to high heterogeneity in included studies, random-effects model was utilized to estimate the pooled estimated of abortion and its subgroups.

Results: Out of 231 reviewed articles, only 11 articles on 24429 women were finally included. The pooled prevalence of induced abortion, spontaneous abortion, legal abortion and overall abortion was estimated as 7.65% (95% CI 4.24 to 11.95), 5.92% (95% CI 0.24 to 18.32), 1.66% (95% CI 0.83 to 2.76) and 7.23% (95% CI 1.07 to 18.22), respectively.

Conclusions: Abortion is a worldwide major public health problem even in Iran and related to different socioeconomic and psychosocial factors. Its prevalence in Iran is high and it remains as reproductive health concern in Iran due to low fertility rate and oncoming up down population growth.

KEYWORDS: Abortion; Miscarriage; Risk factors; Prevalence; Iran; Systematic review

1. Introduction

Abortion is defined as termination of pregnancy at any stage in the baby life, and the technically and professionally definition is termination of pregnancy by surgery or removal of the fetus or embryo from the uterus before birth[1]. Abortion has always been challenging due to its moral, social and spiritual dimensions and

in most societies it is one of the important issues of scientific, demographical and cultural concerns[2]. Spontaneous, intentional and therapeutic are different types of abortion. Spontaneous or accidental abortion is fetus expulsion without using any medical or mechanical methods, or in lack of fetal disorders, and familial related factors, that occurs spontaneously. More than 80% of spontaneous abortions take place in the first trimester, and at least half of them have chromosomal anomalies and about 8% of these abortions remained undiagnosed[3]. Termination of pregnancy with medication or surgery before the fetus can survive is called intentional abortion[4], and if abortion is legally allowed due

Key Points

Question: What is the pooled estimate of abortion incidence in Iran based on a meta-analysis?

Findings: Out of 231 reviewed articles, only 11 articles were finally included. The pooled prevalence of induced abortion, spontaneous abortion, legal abortion and overall abortion was estimated as 7.65%, 5.92%, 1.66% and 7.23%, respectively.

Meaning: Abortion is a major public health problem in Iran that is higher than other Islamic countries leading to worsen the low fertility rate and population growth, as a threaten risk for child bring.

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to necessity of abortion or medical reasons, this type is called therapeutic abortion. Therefore, prevention from fetal abnormalities and protection of mother's health are the main causes of therapeutic abortion[5].

In many developing countries, abortion is illegal unless the pregnancy poses a threat to the mother's health and more than 40% of women live in such areas of the world. However, the possibility of unsafe and unsanitary abortions increases in these countries and exposes mothers to the risk of death and adverse health consequences[6]. The prevalence rate of abortion in Iran has been reported 9% based on a review study[7]. Another study in Tehran, Iran reported that the prevalence of intentional abortion was 14%[8]. Several factors are believed to influence the prevalence of abortion in Iran, including legal, social, cultural, and economic factors[9]. Instead, induced abortion has always faced ethical, philosophical, biological, religious and legal challenges, worldwide[10]. Heart disease is the most common maternal reason for requesting abortion, while beta thalassemia is mentioned as the most common fetal reason[11]. In addition, legal limitations are the primary factor of unsafe abortion and cause mothers to seek out unregulated and potentially dangerous procedures that lead to an increase in treatment costs or illegal abortions[10,12,13].

The main problem is a dramatic occurrence and its growing trend of induced and unsanitary abortions all over the world[14], especially in developing societies that lead to mothers death in reproductive age, and cause hundreds of thousands of physical and sexual disabilities in different societies, including Iran[15]. Nevertheless, there is no accurate data of abortions in Iran, but based on some estimations, the annual figure of about 80 thousand abortions has been mentioned. Based on the result of different studies in Iran, the prevalence and predictive factors of abortion is not clear. This review aimed to estimate the pooled prevalence rate of different types of abortion and the most important related factors of abortion in Iran based on a systematic review and meta-analysis.

2. Methods

2.1. Study setting

In a systematic review, the study population was all Iranian women in reproductivity age who were experienced an abortion. We were searched all related articles and scientific peer reviewed contents that conducted in Iran, during February 1, 2012 to December 31, 2024. For finding relevant sources, Web of Science, PubMed, Google Scholar, Scopus, Science-Direct and SID databases were assessed. Abortion, miscarriage, induced abortion, risk factors, prevalence, incidence, epidemiology, frequency, women, and Iran were our keywords to find the articles using Boolean operators (AND, OR, NOT). In addition, the references of articles were checked to find the missed sources.

2.2. Inclusion and exclusion criteria

All related peer reviewed articles with observational studies including cross-sectional and cohort studies that reported the prevalence or incidence of abortion and were published in Persian or English languages were included. In addition, studies that have a study setting in Iran or one of the Iranian cities, regardless of urban, rural communities and ethnic and religious minorities were included in the study.

In the first stage, all irrelevant studies based on title, abstract and content were excluded from evaluation. Then, non-original articles including case reports, case series, case control, interventional studies and qualitative studies were excluded from this review.

2.3. Assessment of heterogeneity

Chi-square (χ^2) test and tau-square (τ^2) test were used as the heterogeneity indexes in the current study to estimate the between variance among included studies. In addition, the I^2 statistic was used to assess the heterogeneity across study results[16–18].

2.4. Assessment of reporting bias

Bias assessment and quality control of extracted articles were assessed using Cochrane checklist[19]. Egger and Begg tests were utilized to examine the existence of publication bias[20]. These tests evaluated publication bias in the included studies by checking the association of effect size and its standard error. Moreover, funnel plot depicted to visualize the presence of publication bias. These methods made the author able to explore the effect of publication bias on the final estimates[16,21]. Newcastle-Ottawa Scale (NOS) tool was used as an instrument for quality assessment of nonrandomized studies to help us for including the least bias articles[22–24]. Based on the Herzog *et al* instruction, each article scored from 0 to 10 and the study qualification is defined as very good studies: 9–10, good studies: 7–8, satisfactory studies: 5–6, and unsatisfactory studies: 0–4 points[24]. In this review, studies with NOS score less than six were excluded due to high possibility of bias.

2.5. Critical appraisal

After reading the title and abstract of all the searched documents, irrelevant articles were excluded and possibly relevant articles were entered in bibliography manger software, Endnote V21. Then, the duplicated articles and documents were removed and based on the inclusion and exclusion criteria, the full text of suitable articles were evaluated carefully. Two different authors assessed independently the quality of articles and data extraction based on the data collection form. In disagreement situations between two authors for including or excluding a specific study, the third author (judge) run the final

decision based on the evidences.

Critical appraisal of searched studies was assessed by STROBE checklist that suggested for observational studies and then the selected articles were checked by NOS for bias assessment[22,25,26]. The studies' information including author/s, publication year, study setting/place, sample size, prevalence/incidence, type of abortion and the main finding and related factors were recorded into a checklist. After data collection, a spreadsheet was created in Excel and extracted data entered into it to estimate the prevalence and the standard error of prevalence for each study.

The primary outcome in our study was the prevalence of abortion rate and four different types of abortion estimated in this study. Induced abortion refers to safe and effective ending the pregnancy intentionally *via* medical interventions[27], spontaneous abortion refers to losing natural pregnancy before 20 weeks of pregnancy[28], therapeutics or legal abortion refers to abortion with legal medicine permission and overall abortion refers to the all types of abortion regardless of its type. Assessment of related factors of abortion is the secondary outcome in this review.

2.6. Statistical analysis

MedCal (version 23.0.6) and Stata software version 17 (StataCorp, College Station, TX, USA) were used in data analysis. Due to the presence of heterogeneity, a random-effects model in meta-analysis was used to measure the pooled estimate. Random-effects model considered the heterogeneity among studies and the differences in study design, population and demographic variation between studies. Due to the difference in abortion type, we run four various models and four pooled estimates reported based on type of abortion.

2.7. Ethical statement

This review was registered in PROSPERO by 1073757 cod and it is available on <https://www.crd.york.ac.uk/PROSPERO/view/CRD420251073757>. In addition, the study protocol was approved by ethical committee of Qom University of Medical Sciences by IR.MUQ.REC.1402.233 number at 2024.02.04.

3. Results

3.1. Selection of the included studies

Totally 231 different documents were found and after checking duplicate, title, content of abstract and full text, and screening for critical appraisal, finally 11 articles were included in this review and were analyzed (Figure 1). The prevalence of different type of abortions in included studies was reported as induced (6 studies), spontaneous (6 studies), therapeutic or legal abortion (3 studies) and overall abortion (2 studies) was reported and we estimated a pooled prevalence by meta-analysis. Table 1 shows the summary data and results of included articles based on extracted data such as abortion type, abortion prevalence, and causing factors[11,29–38]. Cross-sectional or descriptive was the most prevalent study type and the sample size of the studies ranged from 60 to 5848.

3.2. Abortion types estimate

Reported abortion rates in included studies ranged from 3.8% to 40.8% across studies, but it is considerable that the 40.8% abortion occurrence was reported as lifetime abortion in female sex workers.

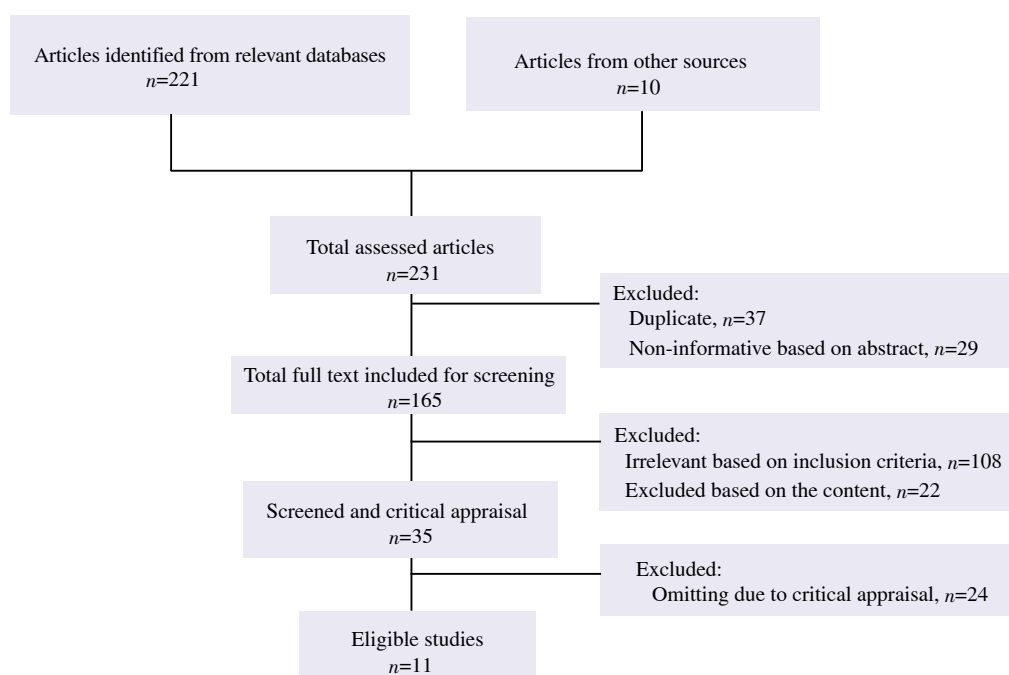


Figure 1. Flowchart of screening of the included studies.

Table 1. Summary of the included studies and extracted related factors of abortion.

No.	Author & Year	Method	Place	Sample size	Related factors of abortion	Quality score
1	Moradinazar <i>et al</i> , 2020[29]	Cohort study	Ravansar, Kurdistan	4831	Secondary education, first pregnancy and marriage age at ≥ 26 years, socioeconomic condition, and hyperthyroid and diabetes were risk factors. High physical activity and body mass index (BMI) < 18.9 kg/m ² and residency in rural area were protective.	9
2	Erfani, 2021[30]	Descriptive	Tehran	3012	Higher education and higher socioeconomic condition, employment, less religious, urban immigrants and women without children or has one more child.	8
3	Alipanahpour <i>et al</i> , 2021[11]	Cross-sectional	Shiraz	5848	Education level, age	8
4	Abbasi <i>et al</i> , 2018[31]	Cross-sectional	Tafresh, Markazi	400	Fetal abnormality, Down's syndrome, thalassemia and anencephaly, chronic kidney failure and chronic hypertension	7
5	Hosseini-Chavoshi <i>et al</i> , 2012[32]	Cross-sectional	Iran	3000	Education, income level, method of prevention	8
6	Roshanfekar <i>et al</i> , 2017[33]	Cross-sectional	Iran	855	Lifetime abortion was 7.8 times higher in women aged > 35 years and 2.4 times higher in financially dependent women.	7
7	Zamanian <i>et al</i> , 2016[34]	Descriptive	Kerman	1020	The influencing factors in abortion were the marital status and the type of abortion.	8
8	Ashtarimahini <i>et al</i> , 2013[35]	Descriptive	Zanjan	545	Job, unintended pregnancy	6
9	Motavalli <i>et al</i> , 2012[36]	Descriptive	Ardabil	1200	Having desired number of children, economic hardship situation, low pregnancy interval, undesirable fetus gender, parents age, academic education and occupation of mother	7
10	Ranji, 2012[37]	Descriptive	Urmia, West Azerbaijan	2705	The desire to postpone or stop having children, economic problems	8
11	Zendehdel <i>et al</i> , 2024[38]	Cross-sectional	Tehran	1013	Importance of religion in fertility, dissatisfied general health, unwanted pregnancy	7

In addition, another study with higher abortion rate estimated the 5-year abortion prevalence in the study population with 23.5%. The lowest prevalence abortion in all studies was assigned to legal and therapeutic abortion and the highest prevalence was belonged to induced abortion type.

The pooled estimate of abortion for every type of abortion calculated by random-effects model due to the heterogeneity among studies (Table 2). The pooled prevalence of induced abortion was calculated 7.65% (95% CI 4.24 to 11.95), and the pooled prevalence for spontaneous abortion, therapeutics or legal abortion and overall abortion was estimated as 5.92% (95% CI 0.24 to 18.32), 1.66% (95% CI 0.83 to 2.76) and 7.23% (95% CI 1.07 to 18.22), respectively.

3.3. Abortion related factors

According to the results of assessed articles in Table 1, education level, income level, financial problems, and contraceptive methods were the most important effective factors of abortion regardless of abortion type. Nevertheless, the risk of spontaneous abortion was higher in women with A blood group than other ABO blood groups. Financial problems and family disputes were effective factors of abortion and it was reported in 25% of women with abortions. However, age and gender, drug addiction, unintended/unwanted pregnancy were some of related factors that increased the risk of spontaneous abortion.

Table 2. The prevalence, sample size and types of abortion and the pooled estimate of prevalence based on random-effects model in meta-analysis.

Study	Sample size	Type of abortion	Proportion (%)	95% CI	Weight (%)
Erfani, 2021	3012	Induced	6.01	5.18 to 6.92	16.75
Hosseini-Chavoshi <i>et al</i> , 2012	3000	Induced	3.80	3.14 to 4.55	16.75
Motavalli <i>et al</i> , 2012	1200	Induced	8.33	6.83 to 10.04	16.50
Ranji, 2012	2705	Induced	17.01	15.61 to 18.47	16.73
Alipanahpour <i>et al</i> , 2021	5848	Induced	4.17	3.67 to 4.72	16.83
Zendehdel <i>et al</i> , 2024	1013	Induced	9.48	7.74 to 11.45	16.43
Total (random effects)	16778	Induced	7.65	4.24 to 11.95	100.00
Moradinazar <i>et al</i> , 2020	4831	Spontaneous	25.71	24.48 to 26.96	16.81
Abbasi <i>et al</i> , 2018	400	Spontaneous	2.50	1.21 to 4.55	16.65
Zamanian <i>et al</i> , 2016	222	Spontaneous	3.15	1.27 to 6.39	16.51
Alipanahpour <i>et al</i> , 2021	5848	Spontaneous	1.79	1.47 to 2.17	16.81
Ashtarimahini <i>et al</i> , 2013	545	Spontaneous	9.54	7.21 to 12.32	16.70
Zamanian <i>et al</i> , 2016	222	Spontaneous	1.81	0.49 to 4.55	16.51
Total (random effects)	12068	Spontaneous	5.92	0.24 to 18.32	100.00
Alipanahpour <i>et al</i> , 2021	5848	Legal/Therapeutics	1.51	1.21 to 1.85	48.38
Ashtarimahini <i>et al</i> , 2013	545	Legal/Therapeutics	2.75	1.55 to 4.50	31.45
Zamanian <i>et al</i> , 2016	222	Legal/Therapeutics	0.45	0.01 to 2.48	20.17
Total (random effects)	6615	Legal/Therapeutics	1.66	0.83 to 2.76	100.00
Ashtarimahini <i>et al</i> , 2013	545	Overall	12.11	9.49 to 15.15	51.12
Zamanian <i>et al</i> , 2016	222	Overall	3.15	1.27 to 6.35	48.88
Total (random effects)	767	Overall	7.23	1.07 to 18.22	100.00

CI: confidential interval.

According to the results of assessed studies, the causing factors of abortion could be described in three main categories. First, individual and life style factors, which include children number, maternal age, job, education level, addiction, smoking and alcohol consumption. Second, clinical factors, such as unintended pregnancy, infection prevention method, neonate' abnormality and blood group type. Third, financial problems constituted another major factor related to abortion in Iran. According to our results, women with high education and those who intended to continue their education, employed women, and those who have two children or were in their last childbearing years, lower level of religiosity were in higher risk for abortion. Furthermore, we concluded that the probability of miscarriage was two times higher in women who had their last pregnancy due to the failure in contraceptive methods.

4. Discussion

The main primary outcome in this review was to determine the representative measure for abortion in Iran and to estimate different type of abortion prevalence based on recent studies in Iranian women. Besides, we aimed to discuss about the determinant factors of abortion in Iran. The overall prevalence of abortion in this study was estimated at 7.23%. Of this, induced abortion accounted for 7.65%, spontaneous abortion for 5.92%, and legal abortion for 1.66%. This result was confirmed by Motaghi *et al*'s study. In this meta-analysis, the abortion was estimated as 8.9 per 1000 women aged 15 to 44 years and 5.34 per 100 live births[39]. Abdoljabbari *et al*'s study

showed that 55.3% of women had an abortion with the suggestion of their husbands and 0.3% because of their work conditions[40]. In the Ranji's study[37], 17% had experienced at least one illegal abortion. In a study in Shiraz of Iran which has been assessed the causes of legal abortion, 9.1% was due to maternal illness and 90.9% was due to fetal illness such as fetal skull and brain disorders[41]. Another study in China showed a high rate of induced abortion about 24.0%-28.9%[42].

The main related factors of abortion in the evaluated articles were including individual factors such as occupation, level of education, unwanted pregnancy, age and number of children[5,14,36,37,43–46]. In addition, clinical factors include infection prevention method, anomalies and blood group type[5,34,43,47], life style factors include drug addiction, smoking and alcohol consumption[43], and financial problems were another significant determinants of abortion[8,44].

Higher education, higher socioeconomic status, having job/income, parents' age, unintended pregnancy and affecting to chronic diseases were the most related factors of abortion in included studies. Education was a significant controversial factor in included studies. While in a study in Turkey, the highest rate of abortion was reported in low-educated women[48], educated women have greater awareness and are in more social responsibilities, and these factors were the affecting factors of abortion, which was in consistent with other studies[14,49]. In another study in China, more repeated induced abortions were observed among married women with children and women with lower education[50]. In addition, women with specialized jobs and high income are not willing to lose their job and social situation due to child bringing[5,43]. Hence, the outbreak

abortion will be higher among this category of women[37,51]. It seems that women with a high level of education are more likely employed and have more financial independence, so they resort to abortion when faced with an unwanted pregnancy[5,36,43,52]. Based on Hashemi *et al*'s study[53], higher mother age, low education level, history of previous coagulation, previous spontaneous abortion, history of previous ectopic pregnancy, religious believes[52,54] and short birth intervals (less than 36 months) were directly associated with miscarriage[55]. However, instead of level of education, religion, ethnicity, number of children, and age of marriage were other related factors of induced abortion[44].

Economic problems are the most common reasons for abortion[37,44]. Financial and economic problems are one of other related factors of abortion in Iran based on included studies. The economic instability of the society and increasing of living costs lead to inability of families to provide a minimal condition for life. Economical costs, not only lead to lower living standards, lower purchasing power and lower family welfare, but also the field of savings life is destroyed and these economic pressures affect all aspects of life, including reproductive behaviors and child bringing[43]. In addition, Mahmoudiani and Abedi's study highlighted the higher abortion prevalence in lower income families[54].

Unhealthy lifestyle could elevate the likelihood of underlying diseases and abortion[56]. Previous studies showed that the risk of miscarriage is a function of factors like lifestyle, including diet, maternal smoking, caffeine or alcohol consumption, and other factors such as obesity, maternal age of 35 years and above, previous history of miscarriage, history of extra uterine pregnancy, and paternal age[56,57].

The desire to stop or postpone childbearing and family economic problems were the most common reasons for abortion based on this review[37]. Since most unintended pregnancies end to abortion, and it threatens the mothers' health, therefore, it is necessary to try to find solutions to prevent abortion especially illegal ones in unhealthy conditions. It is reported that nonmedical providers performed one-third of abortions (33%) and women would seek unsafe abortion in countries where induced abortion is illegal and there are very restrictive rules about abortion[58,59]. Therefore, it seems that change in mothers' views about the family dimension, economic pressures, late marriage, and effect of job and college education of women are the main challenges to lower the abortion rate in every society.

This study was faced to some limitations including unavailability to the articles' full texts or the studies that are not published or not presented in anywhere. In addition, owing to the type of this review, we included observational studies and the quality of searched articles is not acceptable in some cases, and the excluded number of articles increased. Moreover, most of abortions in Iran are illegal and sometimes this type of abortion is not calculated or reported accurately in any type of abortion. Finally, the estimated abortion

rate in Iran is underestimated and the authors suggest national surveys for assessment of all illegal and legal abortion in Iran.

In conclusion, abortion is a major public health problem that occurs worldwide and is one of the most threaten risks for child bring and population size in Iran due to low fertility rate and oncoming up down population growth. Therefore, due to the legal restrictions, most of abortions are performed under unsafe condition and never summed in the number of the reported abortions in official documents. Based on this review, higher education, higher socioeconomic status, having job/income, parents' age, unintended pregnancy and affecting to chronic diseases were the most related factors of abortion in included studies. Nevertheless, the rate of overall, induced and spontaneous abortion based on this study is a disaster and affects the health of mother and her reproductive health in future. Therefore, government and policy makers should plan a national guideline to decrease the abortion rate and its bad consequences.

Conflict of interest statement

The authors of the present study have no conflict of interest.

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Authors' contributions

Roghaye Ahangari, Abolfazl Mohammadbeigi, and Seyedeh Sakineh Latifi-Rostami contributed to presenting the initial idea and design of study. Azadeh Asgarian and Abolfazl Mohammadbeigi have worked in searching for the sources and primary draft of the article. Seyedeh Sakineh Latifi-Rostami and Roghaye Ahangari and Azadeh Asgarian have assessed the quality of articles and critical appraisal of included articles. Finally, all authors accepted the responsibility for the accuracy and correctness of the content of the article with the final approval.

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