Intrauterine device survival in Iranian women: systematic review and meta-analysis

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Abstract

Introduction: The intrauterine device (IUD) is one of the modern contraception methods that is reversible, safe, effective, and with long-term efficacy. The problem of using this method is early discontinuation. The survival of the IUD use has been reported differently in different studies. In this meta-analysis, we estimated average time of surviving in Iranian women. Materials and Methods: We evaluated the incident of IUD removed in the Iranian women with a broad systematic review of the literature regarding MOOSES criteria. ISI, Scopus, Medline, WHO, Cochrane, Web of Science, Biological abstracts, Google Scholar and DARE and Iran Medex, SID, Magiran and IranDoc were searched. We defined inclusion and exclusion criteria for selection of articles. All chosen articles were appraised using Critical Appraisal Skills Programme checklist. Data were extracted regarding prepared sheets. We used a Cochrane Q-test with a significance <0.1 for checking of heterogeneity of results. We defined $I^2 = 50–75\%$ as a medium heterogeneity and $I^2 > 75\%$ as high heterogeneity. We applied both fixed and random effect model by comprehensive meta-analysis software. Results: A total of 14 articles was included in the systematic review. These were obtained from screening 63 potentially relevant citations and reviewing 17 full-text study articles. One-year survival of IUD, for the random effects model was 78.4% (69.8–85.1%). Three-year survival for the random effects model was 69.4% (53.3–81.9%). Five years for the random effects model was 49.7% (36–63.4%). Conclusion: Above half of Iranian IUD users discontinued it within 5 years after insertion, it means half of IUD expected lifetime was used and make additional costs to the state and the consumer. To reduce these costs, it is recommended for Iranian women to use the IUD with 3-year survival, and they should be consulted before insertion.

Keywords: Intrauterine device, Iran, meta-analysis, survival

Introduction

One of the most important family planning program goals is improving the quality of contraceptive use and continue and discontinue of this method is an important indicator of its quality. The intrauterine device (IUD) is one of the modern contraception methods that is reversible, safe, effective, and with long-term efficacy.¹ The lifetime of various kinds of IUD is different from 5 to 10 years, but the problem of using this method is early discontinuation. The survival of the IUD use has been reported differently in different studies.

The study in the USA reports 55% of 11–24-year-old women who choose IUDs keep them for at least 1-year and median and mean survival times in these mothers are 14.1 and 25.1 months, respectively, and did not differ by type of IUD and the most common reasons to remove were expulsion, pain, bleeding, pregnancy desire and pregnancy, and rates did not significantly differ by type of IUD.² In another study, in an urban clinic in the USA. The rate of IUD discontinuation within 1-year was 19.5%. Age, culture, parity, type of IUD, the interval from the last pregnancy, preinsertion counseling, and experience of providers do not predict early discontinuation of IUD.³ The study in Pakistan shows 19.4% of the women remove use of their IUD at 10 months, and the main reason for discontinuation is side effects.⁴ An analysis of the personal reasons for removing IUD use reports. The most common reasons are intended pregnancy (32%) and husband or family attitude against IUD use (26%) and these reasons associated with illiteracy or living in a rural area.⁵

In Iran, the study in Tabriz reports 1-month, 6-month, 1-year, 3-year and 6-year survival rates of IUD use are 98.3%, 89.3%,
79.3%, 58.3% and 36%, respectively, and the most common reasons for discontinuing are pain and bleeding.\cite{6} In another study in Babol median and mean of IUD use survival times are 37 and 36 months and 62% of users discontinued before the end of IUD lifetime.\cite{7} The study in Lenjan shows there is an association between age and length of IUD use and discontinuation for pregnancy desire is more common in rural than urban.\cite{10} The survival rates of IUD use in the study in Hormozgan at 6, 12, 24, 36 and 48 months are 92%, 87%, 75%, 62% and 50%, respectively, and counseling and pregnancy tendency are associated with survival rate in this study.\cite{10} Another study in Isfahan reports 40% of IUD users remove their IUD before the end of the duration and psychological factors like emotional adjustment associated with IUD survival.\cite{9}

According to these studies and the similar studies,\cite{10‑14} it seems mean survival times in IUD users is less than the IUD expected lifetime. If we access to unit estimation of mean survival times in Iranian women, it will be a guideline for IUD selection. Considering that the price of any type of IUD, proportional to the length of its lifetime, thereby making the right choice of the kind of IUD reduces additional costs to the state and the consumer. Thus, the aim of this study was to estimate the mean survival time in Iranian women through meta-analysis study.

**Materials and Methods**

We evaluated the incident of IUD removed in the Iranian women with a broad systematic review of the literature regarding MOOSES criteria. A search limited to English and Persian languages.

**Sources**

**Formula of study question**

Meanwhile, our review focuses on the survival of IUD in 1st and 5th years, we just defined population and outcome (P, O), for our study question.

Our study population was the Iranian married women who had been chosen IUD as a family planning method.

The outcome of interest was the number of women who keep the IUD at the end of 1st and 5th years. The time of study was since April 2000 to December 2012.

**Search strategy**

For electronic and hand searching, we used different key words because of many conflicts in national databases. We applied (“IUD “OR” Inter Uterine Device”) AND (“Iran” “OR” Persia”) for international searching.

**Electronic databases**

We searched electronic databases, including, ISI, Scopus, Medline, WHO, Cochrane, Web of Science, Biological abstracts, Google Scholar, and DARE. Further, four Iranian databases in the medical and life sciences literature were used including Iran Medex, SID, Magiran and IranDoc.

**Grey literature**

In a gray literature searching, we found congresses, dissertations, research projects, abstract books in the study time period. By two independent reviewers. In the OPAC.

**Study selection**

**Inclusion criteria**

The inclusion criteria were all cross-sectional studies that stated characteristics of the study and that used a valid sampling method, measured survival as an outcome, and proper analytical methods inside of Iran.

**Exclusion criteria**

- No outcomes reported
- Study that targeted populations with a specific age, disease or condition.

**Critical appraisal and selection of studies**

Two independent reviewers reviewed all documents, title, and abstracts as a primary screening. Then, the selected papers are appraised critically for the quality of the studies using a Critical Appraisal Skills Program checklist.

Papers without considering standard excluded the analysis.

**Data extraction**

The extracted data were year of the study, first author, province and district of the study, the sample population, sample size, survival time, and standard error (SE) 1st and 5th years. If there were other statistics other than SE, such as a standard deviation (SD), confidence interval (CI), and P value, the proper adjustments were performed to calculate SE.

**Data synthesis and statistical analysis**

We used a Cochrane Q-test with a significance < 0.1 for checking of heterogeneity of results.

We defined $I^2 = 50–75\%$ as a medium heterogeneity and $I^2 > 75\%$ as high heterogeneity. We applied both fix and random effect model by comprehensive meta-analysis software.

**Results**

A total of 14 articles was included in the systematic review [Table 1]. These were obtained from screening 63 potentially relevant citations and reviewing 17 full-text study articles. Common reasons for exclusion at the screening stages are summarized in Figure 1. All of the included studies were cross-sectional and cohort. The quality scores of the considered studies ranged from (9) to (17) and the average score for all (14) studies was (11.7) (SD = 2.43). We defined the quality of selected studies
according to mean and SD. Thus, the articles with scores more than one SD above the mean; as high quality, <1 SD below the mean; as low quality and scores between 9.27 and 14.13 as medium quality was defined.

Details of the characteristics of the selected studies are shown in Table 1.

Data on the survival of the IUD were extracted from the included (14) articles. Nine studies reported the 1-year survival of IUD. Pooling of the results derived from all the included reports independent of study design, yielded an event estimated with CI for fixed effect model 70.7% (CI 95%; 69.2–72.3%) and for the random effects model was 78.4% (CI 95%; 69.8–85.1%) [Figure 2].

The results are not heterogenous (Q square = 243.05, df = 8, P = 0.000, F = 96.7) thus fixed effect model was shown in the forest plot [Figure 2].

Five studies reported the 3-year survival of IUD. Pooling of the results derived from all the included reports independent of study design, yielded an event estimated with CI for fixed effect model 62.1% (CI 95%; 59.7–64.5%) and for the random effects model was 69.4% (CI 95%; 53.3–81.9%) [Figure 3].

The results are not heterogenous (Q square = 163.15, df = 4, P = 0.000, F = 97.5) thus fixed effect model was shown in the forest plot [Figure 3].

Seven studies reported the 5-year survival of IUD. Pooling of the results derived from all the included reports independent of study design, yielded an event estimated with CI for fixed effect model 47.6% (CI 95%; 45.6–49.7%) and for the random effects model was 49.7% (CI 95%; 36–63.4%) [Figure 4].

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**Table 1: The characteristic of the selected studies**

| Sources       | City/state | 5 years survival % | 3 years survival % | 1-year survival % | Number of cases | Quality score |
|---------------|------------|--------------------|--------------------|-------------------|----------------|--------------|
| Jenabi 2008   | Tabriz     | 43.9               |                    | 79.3              | 401            | 10           |
| Yusefi 2001   | Oroomiyeh  |                    | 42                 |                   | 341            | 10           |
| Mohamadpur 2003 | Gonabad   |                    | 78.4               | 92                | 273            | 10           |
| Hajiyani 2002 | Babol      | 40.2               |                    | 53                | 385            | 11           |
| Naseh 2011    | Birjand    | 63                 |                    |                   | 500            | 11           |
| Manzouri 2011 | Isfahan    | 66                 | 87                 | 99                | 248            | 16           |
| Aghamolaei 2007 | Bandar Abbas | 62               |                    |                   | 400            | 14           |
| Farajzadegan 2009 | Isfahan | 60                 |                    |                   | 248            | 17           |
| Shahvary 2004 | Karaj      |                    |                    | 71.7              | 983            | 12           |
| Hesami 2011   | Sarvabad   | 20.8               | 43.5               | 65.3              | 524            | 10           |
| Takfallah 2011 | Semnan    | 48                 |                    |                   | 472            |              |
| Hosceini 2008 | Yazd       | 77                 |                    |                   | 464            | 10           |
| Shahbazzadeh 2009 | Ardebil | 72                 |                    |                   | 301            | 11           |
| Ghodsi 2008   | Hamedan    | 90                 |                    |                   | 250            | 10           |

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**Figure 1:** Flowchart of the study selection process to establish intrauterine device survival identification.

**Figure 2:** Forest plot with point estimation and confidence interval 95% for 1-year survival in nine studies.
The results are not heterogenous (\[Q\text{ square} = 269.27, \, df = 6, \, P = 0.000, \, I^2 = 97.7\]) thus fixed effect model was shown in the forest plot [Figure 4].

Zero of 14 articles were low quality, 12 studies medium and two of total high.

Funnel plot has shown in Figure 5. Egger’s regression intercept showed \(t\) value = 1.97, and \(P = 0.062\).

**Discussion**

The result of this systematic review and meta-analysis showed that 1-year survival of IUD was from 48%\(^{[15]}\) to 99%\(^{[11]}\) This heterogeneity in 1-year survival of IUD could be due to the different selection method or characteristic of the study’s population. Pooling of the results derived from all studies, yielded 1-year survival of IUD was 78.4%, 3-year survival of IUD was 69.4%, and 5-year survival of IUD was 49.7%.

To finding probable heterogeneity, we do subgroup analysis by year of survival, respectively 1, 3, 5 years. There are some reason for heterogeneity of included articles, for example sample size and the quality score. Finally, the I index illustrates that this variety dose not affected heterogeneity of results.

Some studies from other countries have found similar results. The study in urban clinics in the USA reports 1-year survival of IUD was 80.5%\(^{[3]}\) and two studies in Pakistan shows 1-year survival of IUD were 80.6% and 81.1%\(^{[4,16]}\).

Other studies report different results. The study in Vietnam shows 1-year survival of IUD 87.9% and 3-year survival was 73.1%\(^{[17]}\). Another study in Jordanian women reports 1-year survival of IUD was 82.5% and 5-year survival was 68%\(^{[18]}\). The study in France shows 1-year survival of IUD was 89% and 4-year survival was 70%\(^{[19]}\). Theses studies report lower discontinuation rat than in our study\(^{[20]}\). It may be because of different selection method or characteristic of the study’s population.

Although the IUD is the most inexpensive long-term and reversible form of birth control. Unlike other forms of birth control, the IUD only costs money in the beginning. The cost for the medical exam, the IUD, the insertion of the IUD, and follow-up visits to health care provider can range from $500 to $1000. That cost pays for protection that can last to 12 years. In general, hormonal IUDs costs more than the otherone.

### Table 1: IUD survival in Iran

| Study name         | subgroup within study | Statistics for each study | Event rate and 95% CI | Relative weight | Relative weight |
|--------------------|-----------------------|---------------------------|-----------------------|----------------|----------------|
| Yesemi 2001        | treer years           | Event rate 0.619          | 0.566 0.669 4.344 0.000 | 21.68          |
| Mohammadi 2003     | treer years           | Event rate 0.780          | 0.727 0.825 8.068 0.000 | 12.62          |
| Aghamolaei 2007    | treer years           | Event rate 0.680          | 0.633 0.724 7.032 0.000 | 23.46          |
| Hesami 2011        | treer years           | Event rate 0.435          | 0.383 0.478 2.962 0.003 | 34.72          |
| Manzori 2011       | treer years           | Event rate 0.871          | 0.823 0.907 10.081 0.000 | 7.51           |

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**Figure 3:** Forest plot with point estimation and confidence interval 95% for 3-year survival in five studies

**Figure 4:** Forest plot with point estimation and confidence interval 95% for 5-year survival in seven studies

**Figure 5:** Funnel plot for 13 studies included in the meta-analysis
The finding of this systematic review and meta-analysis revealed that above half of Iranian IUD users discontinued it within 5 years after insertion, it means half of IUD expected lifetime was used and make additional costs to the state and the consumer. To reduce these costs, it is recommended for Iranian women to use the IUD with 5-year survival and they should be consulted before insertion. It suggested to the Health care System that provides the IUD with 5-year survival instead of 10 years, for family planning program to save on costs.

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How to cite this article: Farajzadegan Z, Motamedi N, Nouri R, Kheyri M. Intrauterine device survival in Iranian women: Systematic review and meta-analysis. J Fam Med Primary Care 2015;4:203-7.
Source of Support: Nil. Conflict of Interest: None declared.