

## The Prevalence of Urinary Incontinence and Overactive Bladder Among Iranian Women: A Systematic Review and Meta-Analysis

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**Purpose:** Urinary incontinence (UI) is characterized by any involuntary loss of urine, resulting in significant hygiene, emotional, and social challenges. This systematic review and meta-analysis aimed to update the current understanding of the prevalence of UI and overactive bladder (OAB) among Iranian women.

**Materials and Methods:** We conducted an electronic search of PubMed, Embase, Scopus, Web of Science, Google Scholar, Medline, Cochrane, CINAHL, and Biosis from January 1990 to February 2026. Women aged 15 years and over living in Iran were targeted. A total of 23 cross-sectional studies encompassing 27,690 participants were included. Study quality was assessed using the Joanna Briggs Institute methodological guidance for systematic reviews of observational epidemiological studies. The  $I^2$  index was used to estimate heterogeneity; the random-effects model was applied due to high heterogeneity. Publication bias was evaluated using Egger's test, and data analysis was performed using MedCalc software.

**Results:** The overall prevalence of UI was estimated at 39.98% (95% CI: 30.54–49.82). The most prevalent subtype was stress urinary incontinence (SUI) at 26.88% (95% CI: 20.00–34.37). OAB and urge urinary incontinence (UUI) affected 20.13% (95% CI: 15.70–24.95) and 17.09% (95% CI: 9.38–26.55) of women, respectively. Mixed urinary incontinence (MUI) followed, with a prevalence of 14.99% (95% CI: 6.62–25.98).

**Conclusion:** Given the relatively high prevalence of UI and OAB among Iranian women, further research is needed to explore underlying factors and to develop effective prevention, management, and treatment strategies. A clearer understanding of the epidemiology of UI and OAB can support health policy planning and the development of responsive healthcare services.

**Keywords:** urinary incontinence; overactive bladder; epidemiology; women; Iran; systematic review; meta-analysis

### INTRODUCTION

Urinary incontinence (UI), defined as the complaint of any involuntary leakage of urine,<sup>(1)</sup> is one of the most common chronic health problems. It is most common in women of all ages and can negatively impact their quality of life by disrupting daily activities, psychosocial and sexual health, and emotional well-being.<sup>(2-4)</sup> Moreover, it can cause a financial burden on the healthcare system.<sup>(1)</sup> According to the International Continence Society (ICS), UI is classified into three main types. Stress Urinary Incontinence (SUI) is defined as the involuntary leakage of urine during physical activities that increase intra-abdominal pressure (coughing, sneezing, laughing, exercise). Urge Urinary Incontinence (UUI) involves involuntary leakage of urine associated with a strong, sudden urge to urinate. Mixed Urinary Incontinence (MUI) refers to a combination of SUI and UUI.<sup>(1-3)</sup> Additionally, the ICS defines OAB as a subset of lower urinary tract symptoms (LUTS), characterized by the presence of urgency, with or without UUI, typically accompanied by frequency and noc-

turia.<sup>(1)</sup> UI is a multifactorial condition influenced by factors such as aging, obesity, smoking, chronic illnesses, pelvic surgery, and gender, with women being more susceptible.<sup>(5-8)</sup> In women, pregnancy, childbirth, and menopause are key risk factors, with postpartum UI affecting 3–40% of women within the first three months after delivery. The risk is influenced by delivery type, number of births, and previous UI history.<sup>(9-13)</sup>

Previous systematic reviews and meta-analyses indicated a broad range of UI prevalence among women, varying from 12% to 57% across different world regions.<sup>(14,15)</sup> A systematic review and meta-analysis reported a total prevalence of 25.7% in developing countries.<sup>(16)</sup> In Asian countries, 26.4% of women from China, Taiwan, and South Korea reported UI symptoms, with MUI being the most common type.<sup>(17)</sup> In India and Pakistan, the reported prevalence of UI was 21.8% and 11.5%, respectively, with SUI being the most common type.<sup>(18,19)</sup> The prevalence of UI in Iran is estimated based on several hospital-based and a limited number of population-based studies conducted throughout the country.<sup>(20-37)</sup> While the prevalence of UI was 39.5% among

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**Table 1.** The main characteristics of studies.

| Author/Year              | Study Region          | Study Design           | Data Collection                                                     | Sample Size (n)          | Age                       | UI Type Overall                | UI Prevalence (%) SUI                                                   |
|--------------------------|-----------------------|------------------------|---------------------------------------------------------------------|--------------------------|---------------------------|--------------------------------|-------------------------------------------------------------------------|
| Sadeghi-Hassanabadi 1998 | Qashqa'I Tribe        | Cross-sectional survey | Interview & vaginal examination                                     | 1010                     | ---                       | Overall UI                     | 27                                                                      |
| Eftekhari 2006           | Tehran                | Prospective study      | Designed questionnaire                                              | 1000 primiparas          | ---                       | Postpartum SUI                 | 14.1                                                                    |
| Nojomi 2008              | Tehran                | Cross-sectional survey | Interview by a structured questionnaire                             | 411                      | 30-70                     | Overall UI, 27 SUI, UII, MUI   | 18.7                                                                    |
| Sobhgol 2008             | Tabriz                | Cross-sectional survey | Interview by structured questionnaire and vaginal examination       | 330                      | 15-49                     | SUI, UII, MUI and OAB          | 31.8                                                                    |
| Safarinejad 2009         | Iranian women         | Cross-sectional study  | Interview and physical examination                                  | 8748                     | 15-55                     | OAB                            |                                                                         |
| Ahmadi 2010              | Tehran                | Cross-sectional study  | Interview and questionnaire                                         | 800                      | 53.96 ± 9.96              | Overall UI                     | 38.4                                                                    |
| Hajebrahimi 2012         | Tabriz                | Cross-sectional study  | ICIQ-UI SF                                                          | 123                      | 46.30 ± 13.14             | SUI, UII, MUI                  | 34.1                                                                    |
| Eftekhari 2012           | Tehran                | Cross-sectional study  | Questionnaire and physical examination                              | 304                      | 40-55                     | Overall UI, MUI                | 24                                                                      |
| Momenimovahed 2013       | Tehran                | Cross-sectional study  | Questionnaire for Urinary Incontinence Diagnose (QUID)              | 400                      | 46 ± 10.13                | SUI, UII, MUI                  | 55.8                                                                    |
| Mallah 2014              | Tabriz                | Cohort study           | Designed questionnaire                                              | 441 nulliparous          | 28.1 ± 3.7                | Overall UI                     | 39.4% in the third trimester of pregnancy; 31% in the postpartum period |
| Pakgohar 2014            | Rasht                 | Cross-sectional study  | QUID                                                                | 313 postmenopausal women | 52.9 ± 3.68 years (45-60) | SUI, UII, MUI                  | 24.3                                                                    |
| Vasaghi-Gharamaleki 2015 | Tehran                | Cross-sectional study  | Self-report questionnaire                                           | 195 athletes' women      | 24.18 ± 8.70              | SUI                            | 10.77                                                                   |
| Morowatisharifabad 2015  | Yazd                  | Cross-sectional study  | ICIQ-SF questionnaire                                               | 127                      | ≥60                       | Overall UI, SUI, UII, MUI 62.2 | 39.4                                                                    |
| Barat 2015               | Babol                 | Cross-sectional study  | Interview                                                           | 750                      | 48.24 ± 9.95              | SUI, UII, MUI 26.67            | 45                                                                      |
| Komeilifar 2017          | Dezful                | Cross-sectional study  | ICIQ-SF questionnaires                                              | 2000                     | 33.6 ± 8                  | Overall UI, SUI, UII, MUI 57.7 | 38.2                                                                    |
| Moudi 2017               | Babol                 | Cross-sectional study  | Urinary incontinence questionnaire                                  | 590                      | ≥60 (68.2 ± 6.8)          | Overall UI                     | 32.9                                                                    |
| Javadifar 2018           | Ahvaz                 | Cross-sectional study  | ICIQ-SF questionnaires                                              | 2000                     | 33.6 ± 8.75               | Overall UI                     | 57.7                                                                    |
| Zargham 2020             | Isfahan               | Cross-sectional study  | ICIQ-FLUTS                                                          | 2609                     | 40.5 ± 12.24              | SUI, UII, OAB                  | 44.5                                                                    |
| Hakimi 2020              | Tabriz                | Cross-sectional study  | Pelvic Floor Distress Inventory-20                                  | 340 menopausal women     | 54.3 ± 4.0                | SUI and UII                    | 50.9                                                                    |
| Daneshpajooh 2021        | Kerman                | Cross-sectional study  | Urinary incontinence questionnaire                                  | 3100                     | 15-80 (46)                | Overall UI                     | 63                                                                      |
| Zare-Bidaki 2021         | Birjand               | Cross-sectional study  | Researcher-made questionnaire                                       | 3028                     | 32.70 ± 11.49             | Overall UI, SUI, UII, MUI 27.3 | 18.1                                                                    |
| Najafi 2022              | Tabas, South Khorasan | Cross-sectional study  | ICIQ-UI SF                                                          | 369                      | ≥60 (70.86 ± 8.27)        | Overall UI, SUI, UII, MUI 24.9 | 10                                                                      |
| Alizadeh 2023            | Tabriz                | Cross-sectional study  | ICIQ-UI SF, Questionnaire for urinary incontinence diagnosis (QUID) | 433 postmenopausal women | 54.5 ± 2.2                | Overall UI, SUI, UII, MUI 39.5 | 20.6                                                                    |

SUI = Stress Urinary Incontinence; UII = Urge Urinary Incontinence; MUI = Mixed Urinary Incontinence; OAB = Overactive Bladder; ICIQ = International Consultation on Incontinence Questionnaire; QUID = Questionnaire for Urinary Incontinence Diagnosis.

postmenopausal women in Tabriz,<sup>(29)</sup> it rose to 62.2% among women over 60 years old in Yazd.<sup>(30)</sup> UI prevalence was estimated at 63% in Kerman, with a higher rate among the elderly (79%) compared to younger individuals (41%).<sup>(20)</sup> According to a systematic review published in 2019 (in Persian), the overall prevalence of UI among Iranian women was 46%, with SUI accounting for 34%, UII for 19%, and MUI for 24%.<sup>(38)</sup> In a study conducted across five low- and middle-income countries, SUI was identified as the most common type of UI among Iranian women at 38.7%, followed by UII at 32.1% and MUI at 21.1%.<sup>(39)</sup> However, this study included participants of both genders; all 883 participants from Iran were women.

The global prevalence of OAB was estimated at approximately 20%. Limited studies have reported the prevalence of OAB among Iranian women to range between 18.2% and 23.3%.<sup>(21,40-42)</sup> Differences in prevalence rates may be influenced by various factors, including the geographical region, the study design, the definitions of UI used, and the assessment methods employed.<sup>(16,38,39)</sup> Although UI and OAB prevalence have been studied in various regions of the country, there remains limited information regarding the overall prevalence of UI in the Iranian female population. To develop comprehensive programs for the prevention and treatment of UI, the healthcare system requires updated data on this condition. Therefore, this study aimed to review the prevalence of UI and OAB among Iranian women aged 15 years and over, based on a systematic review and meta-analysis.

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## MATERIALS AND METHODS

### Search Terms and Strategy

The search strategy and all subsequent procedures in

**Table 2.** Quality scoring results with the JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data consisting of nine questions (Q1–Q9, see Supporting Information Appendix 2). The questions with answer "yes" are shown with a green circle, with answers "no" as a red circle, and answer "unclear" as an orange circle.

| #  | Authors                    | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Quality  |
|----|----------------------------|----|----|----|----|----|----|----|----|----|----------|
| 1  | Sadeghi-Hassanabadi (1998) | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 2  | Eftekhar (2006)            | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 3  | Nojomi (2008)              | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | Moderate |
| 4  | Sobhgol (2008)             | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 5  | Safarinejad (2009)         | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 6  | Ahmadi (2010)              | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | Moderate |
| 7  | Hajebrahimi (2012)         | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 8  | Eftekhar (2012)            | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | Moderate |
| 9  | Momenimovahed (2013)       | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 10 | Mallah (2014)              | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | Moderate |
| 11 | Pakgozar (2014)            | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 12 | Vasaghi-Gharamaleki (2015) | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | Moderate |
| 13 | Morowatisharifabad (2015)  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | Moderate |
| 14 | Barat (2015)               | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 15 | Komeilifar (2017)          | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 16 | Moudi (2017)               | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | Moderate |
| 17 | Javadifar (2018)           | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 18 | Zargham (2020)             | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 19 | Hakimi (2020)              | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 20 | Daneshpajoo (2021)         | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 21 | Zare-Bidaki (2021)         | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 22 | Najafi (2022)              | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |
| 23 | Alizadeh (2023)            | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | High     |

this review were conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement.<sup>(43)</sup> We conducted a systematic electronic search of English and Persian language databases related to urinary incontinence from January 1990 to March 2025. The databases included PubMed, Embase, Scopus, Web of Science, Google Scholar, Medline, Cochrane, CINAHL, and Biosis. We utilized the following MeSH terms: urinary incontinence, stress urinary incontinence, urge urinary incontinence, mixed urinary incontinence, overactive bladder, epidemiology, prevalence, frequency, women, and Iran.

#### Eligibility Criteria

The searches were limited to Iranian women aged 15 years and over. Full-text cross-sectional, prospective, and cohort articles in both English and Persian languages were included in the study. All titles and abstracts were reviewed by two authors (NS and FD). Full texts were obtained for studies that appeared to be relevant. Following the keyword search, we carried out a background search by reviewing the reference lists of all articles obtained. The exclusion criteria included lack of access to the full text of the article, irrelevant or incomplete data, and duplication.

#### Screening and Data Extraction

After collecting the studies, two authors performed a full-text review to extract the required information. The extracted data included the surname of the first author, the year of publication of the article, the city of research, the number of samples, the average age of participants, and the overall prevalence of OAB, UI, and each of its subtypes.

#### Quality Assessment and Risk of Bias

Two reviewers independently evaluated the quality of the studies using the Methodological Guidance for Systematic Reviews of Observational Epidemiological Studies Reporting Prevalence and Cumulative Incidence Data from the Joanna Briggs Institute. This checklist consisted of nine questions, which covered aspects such as the appropriateness of the sample frame for the target population, sample collection method, sample size, participant characteristics, study location, sample and subgroup analysis, research tools used, research conditions, accuracy of statistical analyses, and the overall adequacy of the article. The selected studies were divided into three qualitative groups based on the score obtained for each study.<sup>(41-45)</sup> To assess the publication bias of the selected studies,

**Table 3.** Publication bias results.

| Type of UI | Egger's Test <i>P</i> -Value |
|------------|------------------------------|
| Overall UI | <i>P</i> = 0.28              |
| SUI        | <i>P</i> = 0.71              |
| UUI        | <i>P</i> = 0.74              |
| MUI        | <i>P</i> = 0.92              |
| OAB        | <i>P</i> = 0.43              |

Egger's test was used through statistical analysis. Findings were presented narratively, including tables and graphs.

### Statistical Analysis

Heterogeneity was analyzed statistically using the standard  $\chi^2$  test with a significance level of less than 0.1. We used the  $I^2$  index to estimate quantitative heterogeneity, with results showing significant heterogeneity (greater than 50%) between studies. Based on the findings of the heterogeneity tests, random-effects meta-analysis was performed and between-study variance ( $\tau^2$ ) was estimated using the DerSimonian–Laird method implemented in MedCalc software (version 22.009). To address the non-normal distribution of the untransformed proportion, the Freeman–Tukey double arcsine transformation was applied prior to pooling, and the pooled estimates were subsequently back-transformed to the original proportion scale for interpretation.

## RESULTS

### Study Characteristics

First, sixty articles were selected through electronic searching; in addition, eight more articles were added by reviewing their references and bibliographies. Of these sixty-eight articles, twelve were duplicates, and thirty-three did not meet the inclusion criteria. Reviewing the full texts of the remaining articles revealed 23 articles about the UI prevalence or one of its subgroups. Of these, one article did not include sufficient information for meta-analysis. Finally, 22 articles met the inclusion criteria and were selected for quantitative synthesis (meta-analysis) to estimate the prevalence of UI. The PRISMA diagram (Figure 1) provides an overview of the search results and the selection of included articles. Descriptive findings of the twenty-three reviewed articles are shown in Table 1. Six studies were conducted in Tehran,<sup>(22,23,25,26,44,45)</sup> five in Tabriz,<sup>(13,27–29,46)</sup> one in Isfahan,<sup>(21)</sup> one in Yazd,<sup>(30)</sup> one in Dezful,<sup>(31)</sup> one in the Qashqai's Tribe,<sup>(32)</sup> one in Rasht,<sup>(47)</sup> one in Babol,<sup>(33)</sup> one in Ahvaz,<sup>(34)</sup> one in Birjand,<sup>(35)</sup> one in South Khorasan,<sup>(36)</sup> one in Kerman,<sup>(20)</sup> and the last one covered all of Iran.<sup>(48)</sup> In fifteen studies, data collection was done through a questionnaire.<sup>(13,20,23,26–31,33,34,36,37,45–47)</sup> A questionnaire with an interview was used in three studies.<sup>(22,24,35)</sup> In one study, a questionnaire and physical examination<sup>(25)</sup> were used, and in three studies, an interview and physical examination<sup>(32,41,48)</sup> were used, and in one study only an interview<sup>(37)</sup> was used, respectively. All studies includ-

ed nulliparous, primiparous, and multiparous women except for two studies<sup>(23,27)</sup> that contained only pregnant nulliparous women.

### Quality Assessment and Risk of Bias

All reviewed articles underwent methodological quality assessment (Table 2). Each question had four answer options (yes, no, unclear, and not applicable), with only 'yes' receiving a score of one, while the other options were assigned a score of zero. The scores ranged from zero (worst case) to nine (best case). Articles with a score of zero to four were categorized as low quality, five to seven as moderate, and over seven as high quality, respectively (Table 2). The quality assessment indicated that the majority of included studies met most of the JBI criteria, suggesting an overall moderate to high quality of evidence.

Based on the results of Egger's test, there was no publication bias in disseminating outcomes for any type of UI in women (Table 3). Figure 2 shows the funnel plot for publication bias.

### Heterogeneity Assessment

The  $I^2$  index was used to estimate quantitative heterogeneity, and the outcomes revealed significant heterogeneity (greater than 50%) between studies. Since an  $I^2$  value above 50% indicates high heterogeneity, we applied the random-effects model and performed subgroup analysis. The results of the  $I^2$  index are reported in Table 4.

### Prevalence of UI

Analyses of the reviewed articles show an overall prevalence of UI estimated at 39.98% (95% CI: 30.54–49.82) (Figure 3).

Figure 4 shows the pooling of studies reporting SUI, estimating its prevalence to be 26.88% (95% CI: 20.00–34.37). The UUI prevalence was estimated to be 17.09% (95% CI: 9.38–26.55) by pooling the results of studies on UUI (Figure 5). The prevalence of MUI was estimated at 14.99% (95% CI: 6.62–25.98) (Figure 6). OAB was estimated to have a prevalence of 20.13% (95% CI: 15.70–24.95) based on the results of three studies (Figure 7). Given the small number of included studies for OAB pooled prevalence, the standard DerSimonian–Laird random-effects model may underestimate uncertainty, leading to overly narrow confidence intervals, and alternative approaches such as the Hartung–Knapp–Sidik–Jonkman (HKSJ) and modified HKSJ methods have been recommended.<sup>(49,50)</sup> However, we conducted a sensitivity analysis using a leave-one-out approach by sequentially excluding individual studies to assess the robustness of pooled estimates. The pooled estimates remained stable across all analyses (range: 18.90–21.89) with overlapping 95% confidence intervals, indicating that the results were not driven by any single study. Therefore, the conclusions of the meta-analysis appear robust despite the limited number of included studies.

**Table 4.** Heterogeneity test results.

| Type of UI | $I^2$ (Inconsistency) | <i>P</i> Value   | 95% Confidence Interval |
|------------|-----------------------|------------------|-------------------------|
| Overall UI | 99.28%                | <i>P</i> < 0.001 | 99.13–99.41             |
| SUI        | 98.74%                | <i>P</i> < 0.001 | 98.47–98.97             |
| UUI        | 99.28%                | <i>P</i> < 0.001 | 99.13–99.40             |
| MUI        | 99.32%                | <i>P</i> < 0.001 | 99.18–99.43             |
| OAB        | 95.54%                | <i>P</i> < 0.001 | 90.19–97.97             |

**Table 5.** Prevalence of all types of incontinence.

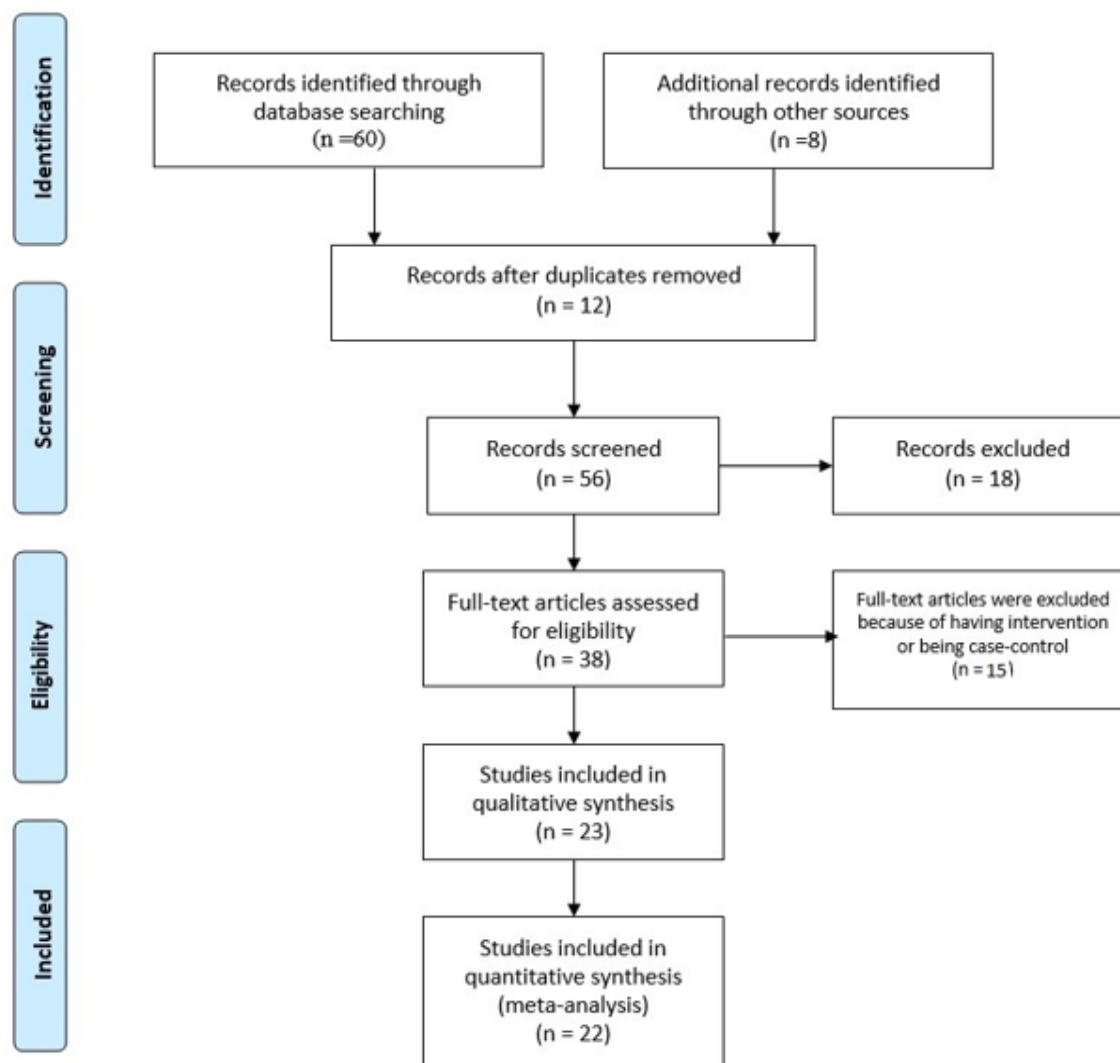
| Type of Incontinence | Prevalence (%) | 95% Confidence Interval |             |
|----------------------|----------------|-------------------------|-------------|
|                      |                | Lower Limit             | Upper Limit |
| Overall UI           | 39.98          | 30.54                   | 49.82       |
| SUI                  | 26.88          | 20.007                  | 34.37       |
| UUI                  | 17.09          | 9.38                    | 26.55       |
| MUI                  | 14.99          | 6.62                    | 25.98       |
| OAB                  | 20.13          | 15.70                   | 24.95       |

The prevalence of UI in the third trimester of pregnancy and the postpartum period was reported as 39.4% and 31%, respectively.<sup>(27)</sup> **Table 5** shows the prevalence of all types of UI in detail.

## DISCUSSION

This meta-analysis was conducted to review the prevalence of both UI and OAB among Iranian women. A total of 22 articles, including 27,690 participants, were included in the study. The overall prevalence of UI and OAB was estimated at 39.98% and 20.13%, respectively. SUI was the most prevalent subtype, with a prevalence of 26.88%, followed by UUI at 17.09%,

and MUI at 15%. A recent study conducted in five low- and middle-income countries found that among Iranian women, SUI was the most prevalent type at 38.7%, followed by UUI at 32.1% and MUI at 21.1%.<sup>(39)</sup> Like the present study, SUI was the most common subtype, while MUI was the least common. Although the study included both men and women overall, all 883 participants from Iran were female.<sup>(39)</sup> A systematic review and meta-analysis investigated the prevalence of female UI in the developing world, which also includes Iran.<sup>(16)</sup> The total prevalence of UI was estimated at 25.7%, and the prevalence rates for stress, urgency, and MUI were 12.6%, 5.3%, and 9.1%, respectively,<sup>(16)</sup> which is


**Figure 1.** PRISMA diagram outlining the literature search.

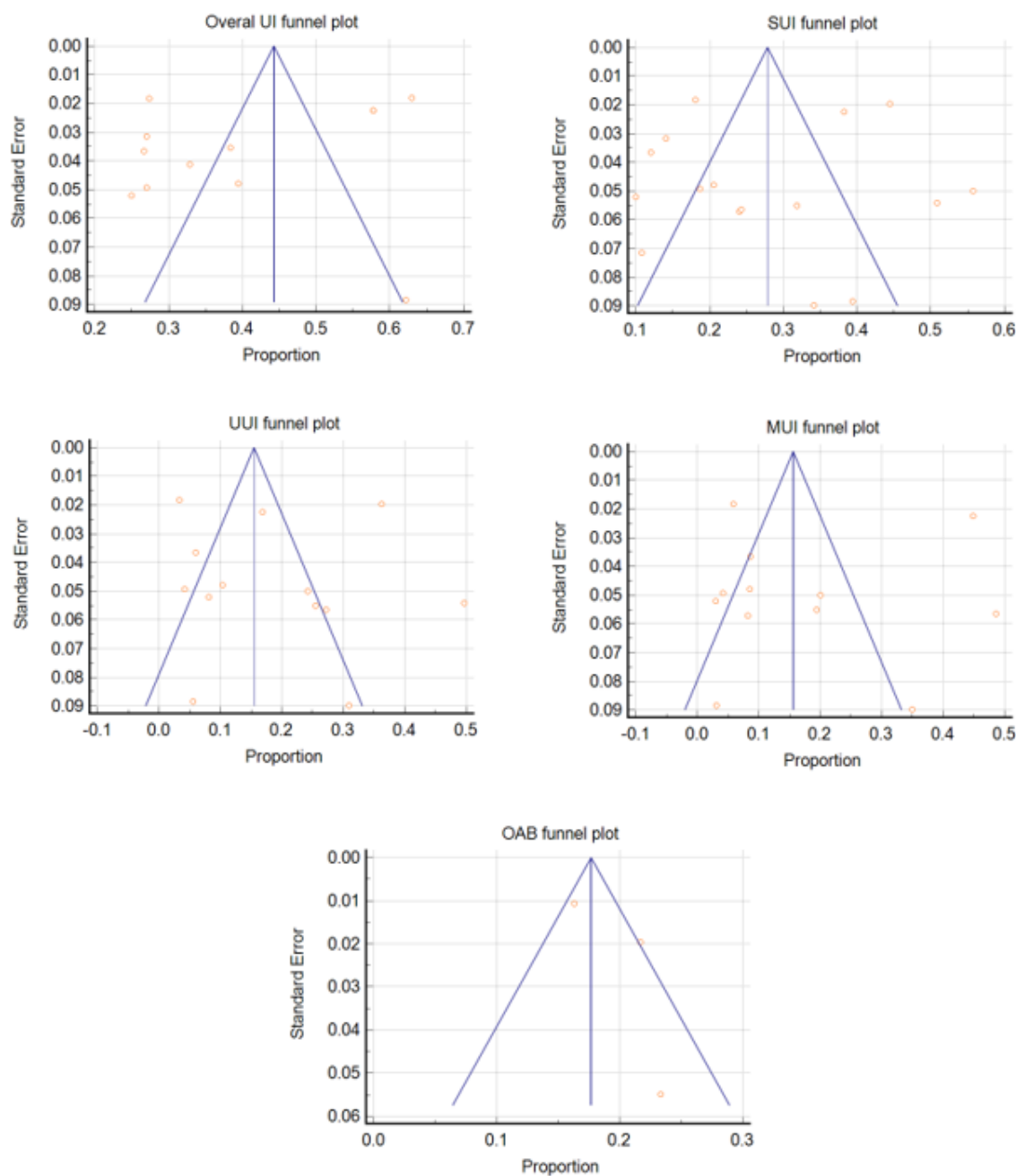


Figure 2. Funnel plots of publication bias assessment.

significantly lower than the UI percentages obtained in the present study. The only published systematic review on Iranian women (in Persian) reported an overall prevalence of UI at 46%, with SUI accounting for 34%, UUI for 19%, and MUI for 24%.<sup>(38)</sup> However, while the overall rates of UI and their types differ somewhat from those reported in the present study, both indicate that SUI is the most common type. Batmani et al., in a meta-analysis of 29 studies involving a total sample of 518,465 individuals, reported a global prevalence of UI among women over 55 years to be 37.1% (95% CI: 29.6–45.4%).<sup>(51)</sup> A systematic review by Almousa et al. reported a wide variation in UI prevalence among wom-

en, ranging from 1% to 42.2%, with SUI being the most common subtype, ranging from 12.5% to 79%.<sup>(52)</sup> Based on Cerruto et al.'s study, the prevalence of UI in European countries ranged from 14.1% to 68.8%, which increases with age. Such differences in prevalence mainly depend on the heterogeneity of studies and methodological variation in prevalence estimation, as well as the demographic characteristics of samples. Additionally, the maternal age, body mass index, family history of UI, and parity are recognized as main risk factors for UI in pregnancy.<sup>(53)</sup> As another covariate, studies found a positive association between UI and back or pelvic girdle pain for at least one type of incontinence, which

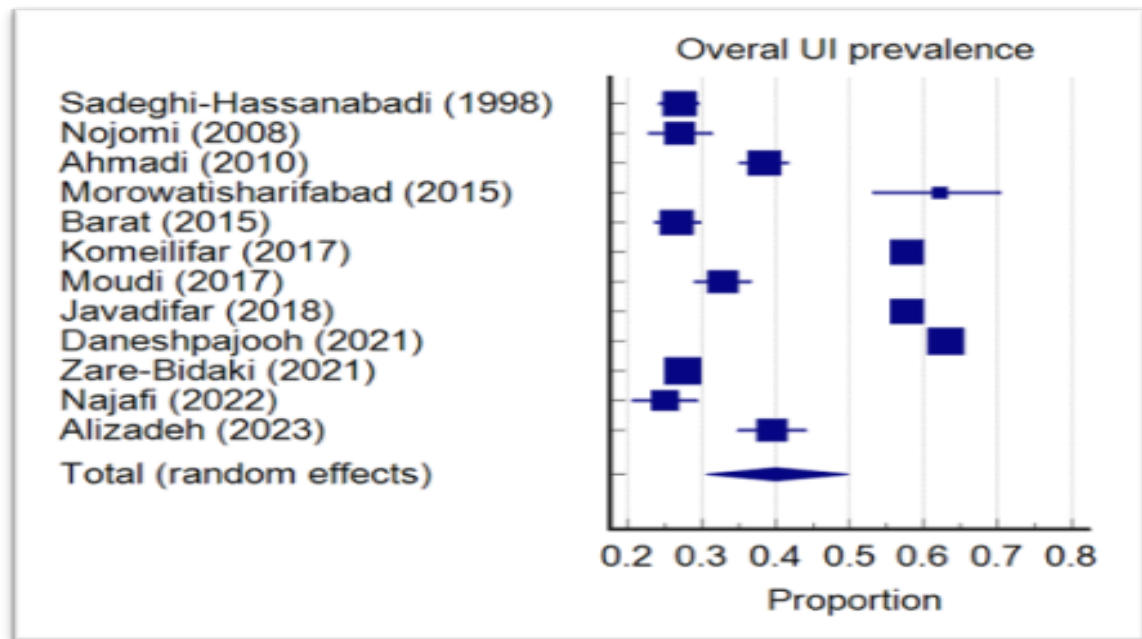


Figure 3. Overall UI Prevalence.

mainly depends on pain and incontinence subtypes.<sup>(54,55)</sup> This point could be taken into account in future research on prevalence in Iran. In another published article on 24 studies in the Western world, including 35,064 women, the weighted mean prevalence of UI in postpartum women was 31.0%. Although prevalence initially decreased by three months postpartum, it rose again to 32% by one year, nearing

levels seen in the third trimester of pregnancy. SUI, with a rate of 54%, was the most common type.<sup>(56)</sup> More than 60% of community-dwelling adult women in the United States experience some form of UI, representing an increase from earlier estimates of 38%–49% based on data from 1999 to 2004. Over 20% report moderate to severe symptoms. Among these cases, SUI accounts for 37.5%, UUI for 22%, and MUI for 31.35%. The ris-

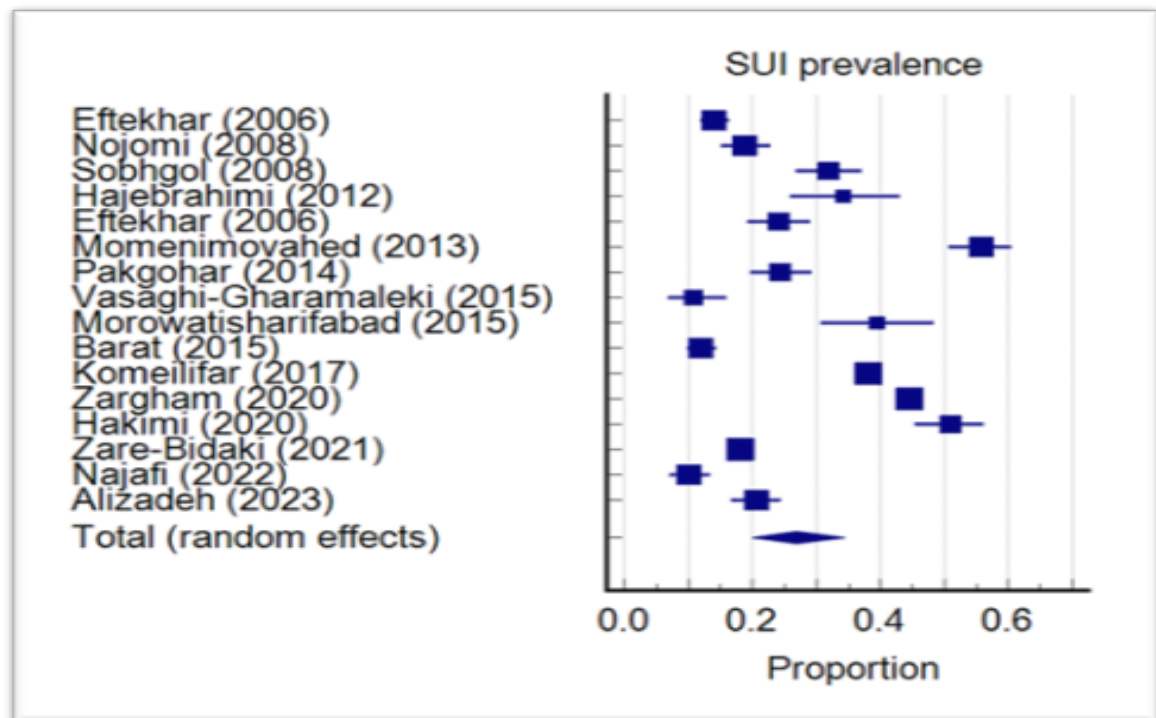


Figure 4. SUI Prevalence.

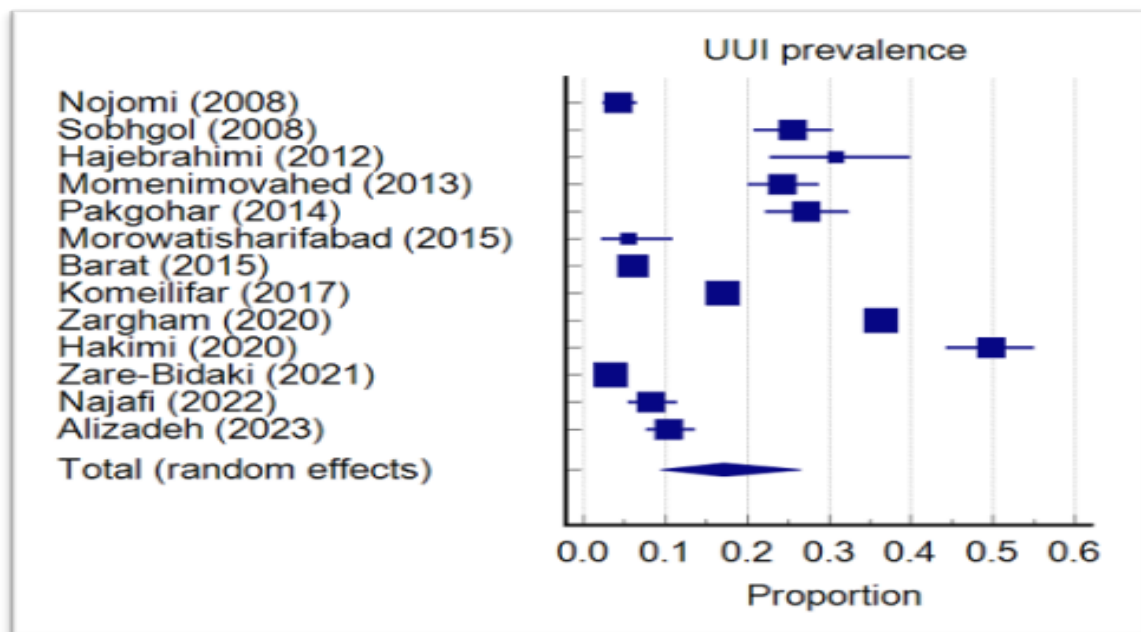


Figure 5. UUI Prevalence.

ing prevalence of UI may be attributed to population aging and increasing rates of obesity.<sup>(57)</sup> Based on a telephone survey of 1,000 individuals in Canada (52% women and 48% men), 34.5% of women reported experiencing urinary leakage of varying severity, compared to 12% of men. The overall distribution of UI in Canada has remained unchanged since 2004.<sup>(58)</sup> A meta-analysis of 32 published articles in both English and Chinese

languages reported a 26% prevalence of postpartum UI (95% CI: 21%–30%). Additionally, vaginal delivery and neonates with a weight over 4 kg are identified as significant risk factors for postpartum UI.<sup>(59)</sup> A study in Saudi Arabia found a 32.4% prevalence of UI among 516 women, with risk factors including age, marital status, BMI, childbirth, and vaginal surgery. Despite its impact on social, household, and work activities, few

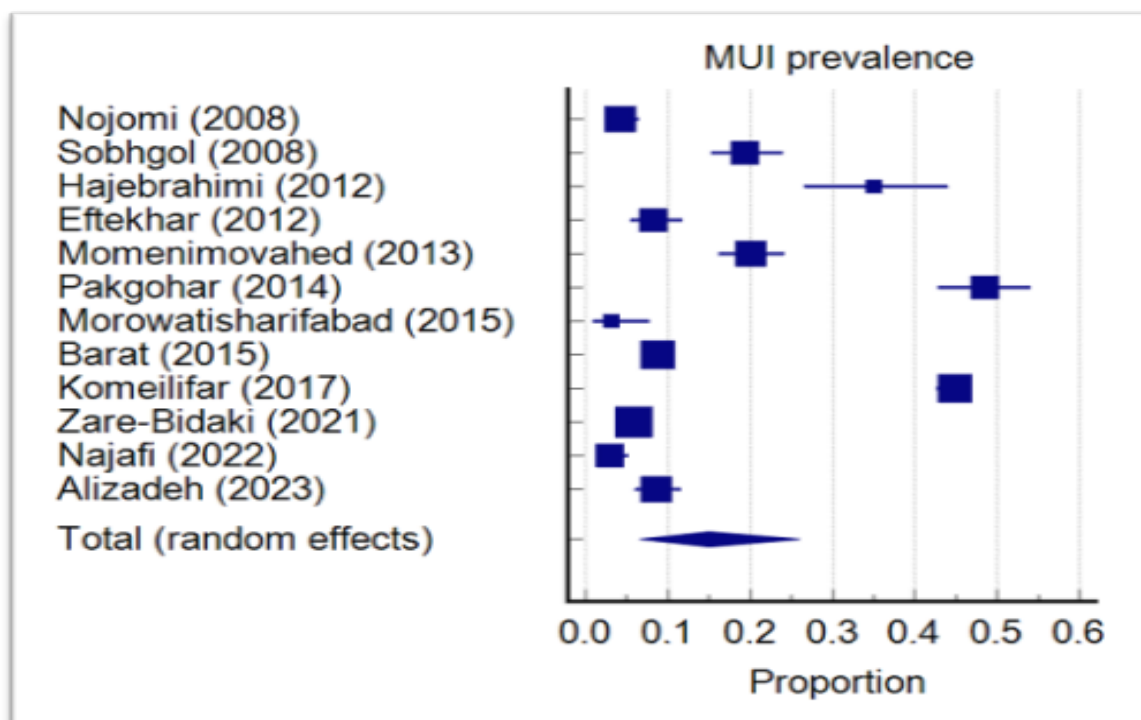


Figure 6. MUI Prevalence

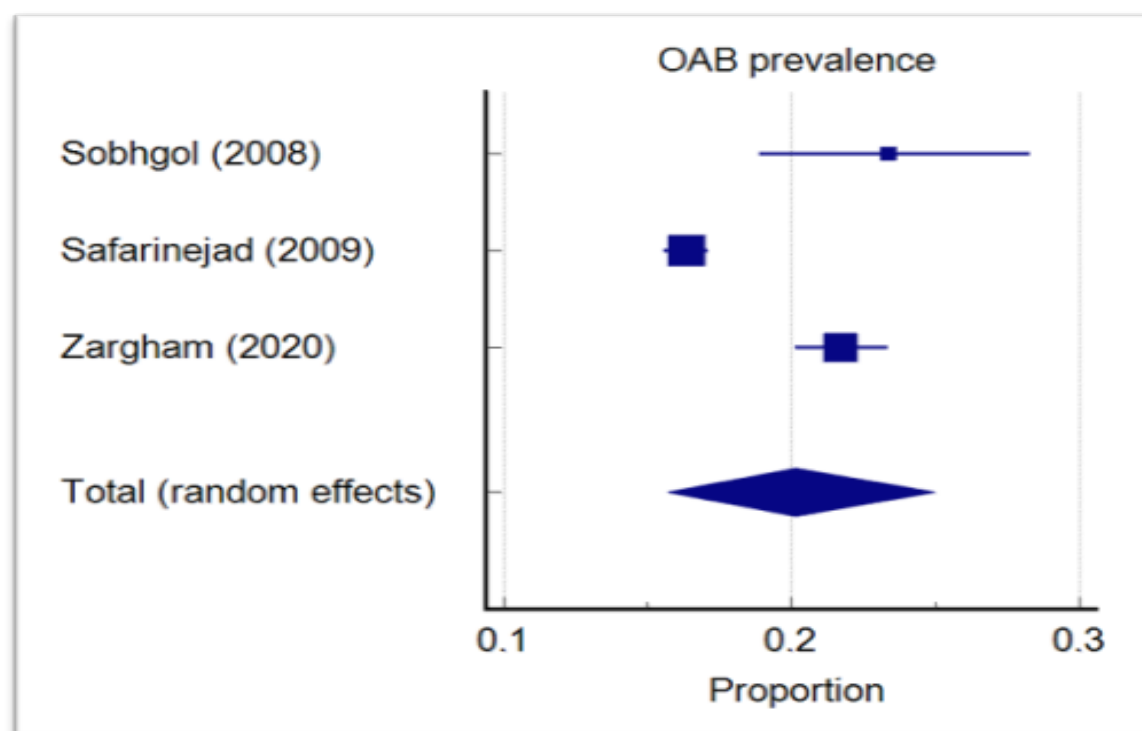


Figure 7. OAB Prevalence.

women sought medical help, and over half reported no improvement after consultation.<sup>(60)</sup> A systematic review of studies from countries in the Persian Gulf region found that the prevalence of UI among women ranged from 20.3% to 54.5%, with SUI being the most reported type. Chronic respiratory conditions and constipation were identified as the primary predisposing factors.<sup>(61)</sup> UI prevalence varies widely across regions, likely due to cultural differences and varying research methods.<sup>(51,62)</sup> It is primarily linked to anatomical, physiological, and functional changes in the pelvic floor.<sup>(59,63)</sup> Key risk factors include age, parity, mode of delivery, menopause, limited mobility, and certain chronic conditions, particularly diabetes, which is associated with UUI due to bladder neuropathy.<sup>(51,53,64,65)</sup> Hysterectomy and pelvic surgeries also contribute to UI risk, while the roles of obesity and assisted or vaginal delivery remain debated.<sup>(57,66)</sup> Musculoskeletal issues such as arthritis and varicose veins show significant associations, with possible links to joint pain, osteoporosis, and cardiovascular conditions.<sup>(67)</sup> In Iran, UI is notably common among women of reproductive age, especially those with higher parity or specific delivery modes.<sup>(29)</sup> SUI is more prevalent in younger and middle-aged women, whereas urge and mixed types are more common in older women.<sup>(16,38,39)</sup>

In the present study, the overall prevalence of OAB was estimated at 20.13%. This aligns with findings from limited studies conducted among Iranian women, which have reported prevalence rates ranging from 18.2% to 23.3%.<sup>(13,21,48)</sup> A recent meta-analysis of 53 studies involving 610,438 participants estimated the global prevalence of OAB at 20% (95% CI: 18–21%), which was 21.9% in women (95% CI: 0.20–0.24).<sup>(42)</sup> It is estimated that OAB affects between 1.4 and 2.5 million women in

Canada.<sup>(68)</sup> OAB was also more prevalent among individuals who were overweight, obese, aged 60 or older, and those living in middle-income countries compared to high-income countries.<sup>(42)</sup>

Comparing findings across studies remains challenging due to the absence of standardized definitions and consistent, reproducible methods for assessing UI and OAB. Consequently, reported prevalence rates for both conditions vary depending on the definitions and diagnostic approaches used. To our knowledge, no comprehensive epidemiological study has assessed UI prevalence in the general female population of Iran; most existing studies are based in clinical settings and focus on women during their postpartum or reproductive ages. Our study assessed the prevalence of UI and OAB among all women aged 15 and older, without classification by age, postpartum status, menopausal status, or physical activity level.

In the present study, some limitations are acknowledged. Conventional funnel plots (effect estimate vs. standard error) were used to assess publication bias. We note that MedCalc does not provide funnel plots of study size against log odds, which have been suggested as a more accurate approach for meta-analyses of proportions.<sup>(69)</sup> This limitation is acknowledged in the interpretation of the results. Another limitation was the inability to apply population weights for inverse probability weighting, along with limited access to unpublished data sources. Furthermore, the substantial heterogeneity observed across studies may be attributed to differences in study populations, age distributions, menopausal status, and assessment methods. However, formal exploration of these sources through subgroup analysis or meta-regression was limited by inconsistent reporting and methodological variability among the included studies.

Prediction intervals, which may better reflect the dispersion of true effects when heterogeneity is high, could be considered when interpreting the pooled estimates. Also, for future studies, it is suggested to develop a standardized protocol considering standard definitions of UI, measurement tools, and population-based studies in Iran. As a suggestion, future epidemiological studies should systematically collect and report individual-level risk factors for urinary incontinence, including parity, body mass index, and mode of delivery, to enable more comprehensive evidence synthesis.

## CONCLUSIONS

Urinary incontinence represents a significant public health burden. This study aimed to provide an updated overview of the prevalence of UI among women aged 15 years and over in the general population of Iran by reviewing existing research. The findings can inform the development of targeted healthcare programs for women with UI. A clearer understanding of the general epidemiology and associated risk factors will enable the healthcare system to deliver more effective and responsive treatment services.

## SUMMARY

Urinary incontinence affects ~40% and overactive bladder ~20% of Iranian women. Stress incontinence is the most common subtype. Targeted healthcare programs and population-based research are urgently needed in Iran.

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## CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

## AVAILABILITY OF DATA AND MATERIAL

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

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