

Maria Angela Cerruto
Carolina D'Elia
Alberto Aloisi
Miriam Fabrello
Walter Artibani

Department of Urology, AOUI Verona,
Verona, Italy

Prevalence, Incidence and Obstetric Factors' Impact on Female Urinary Incontinence in Europe: A Systematic Review

Key Words

Childbirth · Obstetric care · Overactive urinary bladder · Pelvic floor muscle training · Pregnancy · Urinary incontinence

Abstract

Objectives: A systematic review of the published data on the prevalence, incidence and risk factors of female urinary incontinence (UI) and obstetric treatment of UI in Europe. **Data Sources:** Epidemiologic studies were sought via PubMed to identify articles published in English, French, Spanish, German and Italian between 2000 and September 30, 2010, in Europe. **Results:** The prevalence of UI ranged from 14.1 to 68.8% and increased with increasing age. Significant risk factors for UI in pregnancy were maternal age ≥ 35 years and initial body mass index, a family history of UI and parity. UI in women who delivered 'at term' ranged from 26 to 40.2%, with a remission rate of 3 months after childbirth of up to 86.4%. Pelvic floor muscle training may help to prevent postpartum UI in primiparous women without UI during pregnancy. **Conclusion:** UI definition, outcome measures, survey methods and validation criteria are still heterogeneous, and thus it is difficult to compare data and impossible to draw definite conclusions.

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Introduction

According to the most recent definition of the International Continence Society (ICS), urinary incontinence (UI), a symptom of impaired storage, 'is the complaint of any involuntary leakage of urine' [1]. In each specific circumstance, UI should be further described by specifying its relevant factors, e.g. type, frequency, severity, precipitating factors, social impact, effect on hygiene and quality of life, the management of the leakage and whether or not the individual seeks or desires help because of UI.

UI is a prevalent, bothersome and costly condition, affecting primarily women. UI is not a lethal condition, but it deeply affects a woman's quality of life. The issue of UI has been well documented and there are national and international networks focusing on the condition. However, systematic, reliable and consistent data are lacking, particularly with regard to certain groups of the female population. Tackling inequalities in health and improving quality of life are listed as two of the overall aims of the Public Health Action Program.

Undoubtedly, the symptom of UI is a common problem, thus factors affecting its prevalence are often sought by clinicians, health researchers and service planners to improve the management and treatment of those affected. Accurate prevalence data are difficult to retrieve from the epidemiologic UI literature, since there are striking differences among the studies in terms of methodologies,

Table 1. Exact search strings

Queries ¹	Hits, n
(1) {'Urinary Incontinence' [MeSH] OR 'Urinary Incontinence, Urge' [MeSH] OR 'Urinary Incontinence, Stress' [MeSH]) OR 'Urinary Bladder, Overactive' [MeSH]} AND 'Prevalence' [MeSH]	552
(2) {'Urinary Incontinence' [MeSH] OR 'Urinary Incontinence, Urge' [MeSH] OR 'Urinary Incontinence, Stress' [MeSH]) OR 'Urinary Bladder, Overactive' [MeSH]} AND 'Incidence' [MeSH]	217
(3) {'Urinary Incontinence' [MeSH] OR 'Urinary Incontinence, Urge' [MeSH] OR 'Urinary Incontinence, Stress' [MeSH]) OR 'Urinary Bladder, Overactive' [MeSH]} AND 'Pregnancy' [MeSH]	490
(4) {'Urinary Incontinence' [MeSH] OR 'Urinary Incontinence, Urge' [MeSH] OR 'Urinary Incontinence, Stress' [MeSH]) OR 'Urinary Bladder, Overactive' [MeSH]} AND 'Quality of Life' [MeSH]	970
<i>We extended the literature search with key words, using a free text search to identify relevant studies published from 2000 to 2010</i>	
(5) 'Urinary Incontinence' AND 'Prevalence'	1,969
(6) 'Urinary Incontinence' AND 'Incidence'	2,029
(7) 'Urinary Incontinence' AND 'Pregnancy'	632
(8) 'Urinary Incontinence' AND 'Childbirth'	179
(9) 'Urinary Incontinence' AND 'Vaginal Delivery'	279
(10) 'Pelvic Floor Muscle Training' AND 'Pregnancy'	56
(11) 'Pelvic Floor Muscle Training' AND 'Childbirth'	20
(12) 'Urinary Incontinence' AND 'Quality of Life'	1,538
(13) 'Urinary Incontinence' AND 'Cost'	351
(14) 'Urinary Incontinence' AND 'Cost-Effectiveness'	93
(15) 'Urinary Incontinence' AND 'Obstetrics'	1,580
(16) 'Urinary Incontinence' AND 'Economic Burden'	37
(17) 'Urinary Incontinence' AND 'Social Burden'	18

¹ Entry date from 2000/01/01 to 2010/09/30 for studies on humans/females published in English, Spanish, German, French and Italian.

UI definitions and populations considered, which hinder the determination of more accurate estimates [2, 3].

The first aim of this paper, developed within the European project 'Ob.Surve – Surveillance System: Occurrence of Urinary Incontinence in Women as a Consequence of Inefficient or Inappropriate Obstetric Care' is to answer the following question: 'inefficient' and 'inappropriate' obstetric care: what does that mean?' The second aim is to perform a review of the European literature on female SUI targeting the following issues: (1) The prevalence and incidence rates of UI in women in Europe and specific UI subtypes. (2) Possible effects of pregnancy and childbirth on UI incidence and prevalence. (3) Possible effects of obstetric factors on UI prevalence and incidence in women after delivery in Europe.

Materials and Methods

A systematic review of the literature was performed in September 2010 using MEDLINE via PubMed, and manual searches of reference lists from systematic reviews and consensus conferences. Therefore, we employed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist [4] and Comprehensive Meta-Analysis® (v.2) software (Biostat, Englewood, N.J., USA) was used for statistical analyses. MEDLINE was searched for the following terms (either alone or in combination) including both 'MeSH' (medical subject heading) and 'free text' protocols: 'urinary incontinence', 'urinary incontinence, urge', 'urinary incontinence, stress', 'urinary bladder, overactive', 'prevalence', 'incidence', 'pregnancy', 'childbirth', 'vaginal delivery' and 'caesarean delivery' (table 1).

All work was conducted by four investigators (M.A.C., C.D.E., A.A. and M.F.) under the guidance of the project manager (W.A.).

All investigators individually reviewed all the abstracts of the retrieved studies in order to select the papers that were relevant to the review topic and independently decided on the eligibility of the studies according to the recommendations from the Cochrane manual for systematic reviews [5]. The investigators reviewed abstracts to exclude all studies in which female UI prevalence and incidence were not explicitly stated, animal or in vitro experiments, and analyses of results taken directly from abstracts, letters, comments and case reports. We confined the eligible target population to European female adults. The epidemiologic studies published in English, Spanish, French, German and Italian between 2000 and September 2010 were examined to identify studies with eligible outcomes.

Data were extracted separately and independently by two of the authors and were cross-checked.

The prevalence and incidence rates of UI in women in Europe were determined. We included population-based studies that examined the prevalence and incidence of UI in women in Europe. We included cohort, cross-sectional and case-control studies that examined risk factors for female UI. Finally, we confirmed eligible levels of evidence for each research issue.

The following articles were included for full review: for issues regarding the prevalence and incidence of female UI, large, population-based, cross-sectional or cohort studies and analyses of population-based registries or nationally representative administrative databases; regarding risk factors of UI, baseline data from clinical trials and case-control studies, and regarding the possible effects of obstetric interventions, randomized, controlled, clinical trials; multicenter, nonrandomized, clinical trials, and observational studies without excluding any study that reported the targeted outcome rates among UI patients.

The following studies were excluded: studies including target populations such as children, adolescents, males, institutionalized females or patients with specific comorbidities (e.g. diabetes, obesity and/or neurological diseases), and studies on non-European females.

Study quality was analyzed using the framework recommended in the manual of comparative effectiveness reviews [6].

Study evaluation and data extraction were performed manually and independently by four researchers. Any discrepancies were discussed. Quality control was conducted by the researchers. We abstracted the prevalence and incidence of UI as reported by

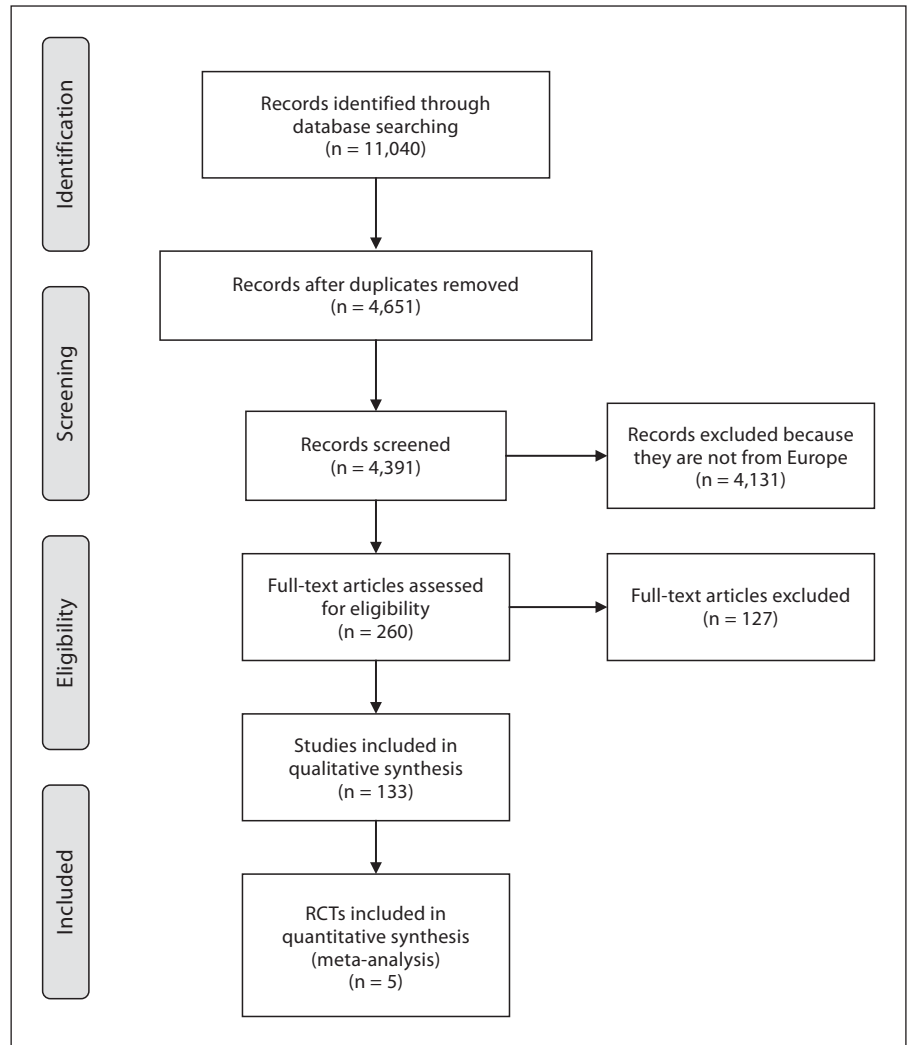


Fig. 1. PRISMA flow diagram [67].

the authors, including number of prevalent and incident cases; cumulative incidence during the study period to estimate annual incidence rates; adjusted relative measures of the association as reported relative risk, odds ratio (OR), or hazard ratio (HR), and the time when the outcomes were assessed and follow-up time after intervention. We extracted author-reported adjustments for patient age, race, gender, confounding factors and ‘treatment’ status (Appendix).

Results

From screening of 4,391 records, 260 full-text articles were retrieved with 133 articles included in the systematic review and 5 randomized controlled trials (RCTs) included in the meta-analysis (fig. 1).

Prevalence and Incidence Rates of UI in Women in Europe and Specific UI Subtypes

Studies Reporting UI Prevalence

We identified 17 studies that investigated the prevalence of any UI type exclusively in European female study cohorts. They reported prevalence rates of 16.1–68.8% [7, 8]. The remaining studies investigated UI in both sexes in community-living populations, and thus it was possible to extract female prevalence rates, too. They reported female prevalence rates of 13.1–70.9% [9, 10]. The most prevalent type of UI was stress UI (SUI), ranging from 13 to 50% [7, 11] in the former group of analyzed studies [8] and from 6.4 to 42.2% [9, 12] in the latter. The number of women included in the former group ranged from 405 [13] to 27,936 [11] and in the latter from 227 to 142,651 [14,

15]. Study populations came from population-based, cross-sectional surveys carried out in the following European countries: Austria, Denmark, Finland, France, Germany, Greece, Italy, Norway, Portugal, Spain, Sweden, The Netherlands, UK and Turkey. UI was reported across different age groups, varying from specific age groups to a broad age range. Several studies reported the prevalence of different UI types, including SUI, urge (UUI) and mixed UI (MUI). The methods used to collect data varied widely (postal, telephone and face-to-face personal interviews, and postal and self-completion questionnaires) as well as UI definition, and only a few studies employed validated questionnaires.

Differences between Studies

There were many aspects of the identified studies that were dissimilar. These included the age groups; the response rate to the different surveys; the European area investigated; whether the type of UI was specified (SUI, UUI or MUI); the different questionnaires administered; whether data collection was by postal or self-completion questionnaires, face-to-face interview, computer-assisted telephone interview, and the time frame for which UI was reported.

Differences in the Questionnaires Employed

Most studies used institutionalized questionnaires which applied different UI definitions (for more information, see online suppl. table 1; for all online suppl. material, see www.karger.com/doi/10.1159/000339929). The validated questionnaires used were: Urogenital Distress Inventory (UDI), International Consultation on Incontinence Questionnaire Short Form (ICIQ-SF) and Bristol Female Lower Urinary Tract Symptoms (BLUTS).

Age-Specific Prevalence of UI

In the studies that compared the prevalence of UI across different age groups, the prevalence was reported to be lowest in the younger groups, but the differences between estimates for the age groups were only in a few studies statistically assessed [8, 12, 16–19].

Results of Studies Reporting UI Incidence

Seven studies examined the incidence of UI in Europe [20–26]. One study used a validated questionnaire (BLUTS) to investigate UI [22]. Wennberg et al. [20] carried out a longitudinal population-based study in one primary health care district in Sweden and analyzed data from women aged ≥ 20 years in 1991 and 6 years later. They reported an overall incidence of 21% and remission

in 34%. At a 6-year follow-up, Nuotio et al. [21] reassessed 240 ladies ≥ 70 years from the 3rd wave of the Tampere longitudinal study of aging initiated in 1979 and found an overall incidence of UUI and/or MUI of 17%. Wehrberger et al. [22] evaluated data from 441 women subjected to a free health investigation in 1999 in Austria and reassessed in 2005. They found an overall incidence of 25.6% (mean annual incidence of 3.9%) and remission of 19% (mean annual remission of 2.9%). In a prospective population cohort study conducted in the UK in 12,570 middle-aged and older women at baseline and the 1-year follow-up, the incidence rates of SUI and MUI were 3.6 and 4.5%, respectively [23]. A 1-year SUI incidence rate of 8.3% was derived from the Leicestershire MRC Incontinence study [24]. Results from one ongoing longitudinal cohort study in 2,277 women aged 40–60 years showed an annual incidence of one of more types of UI of 5.8%, with a remission rate of 37.7% [25]. Swedish women < 65 years scheduled for a gynecologic health examination in 1993 were reassessed 5 years later by Samuelsson et al. [26]. They showed a mean annual incidence of 2.9% (overall incidence of 13.7%) with a mean annual remission of 5.9% (overall remission of 27.8%).

Discussion and Conclusion

We found a wide variation in the estimates of the prevalence and incidence of female UI in Europe. Age represents a significant risk factor. Despite the underrepresentation of elderly women, the highest prevalence rates were reported for this age group, but these findings came from a few studies that formally tested whether the estimates of prevalence in women of different age groups were statistically different from other groups. The methods used to collect data, as well as the way in which UI was diagnosed, contributed further to the wide variability in findings. Studies on UI incidence highlighted that UI often may be transient. Our findings support the need for further research to better establish the age-specific prevalence and incidence of UI in women in different European countries using homogeneous and validated questionnaires in population-based samples in which the issues of selection bias and response rate are carefully considered in order to obtain comparable results.

Effect of Pregnancy and Childbirth on UI Incidence and Prevalence

We identified 7 studies that investigated the prevalence of UI during pregnancy in Europe [27–33]. Four

studies were conducted in continent primiparous women [27–30] before pregnancy; 2 studies evaluated all pregnant women [31, 32], and in 1 study, carried out in primiparas, the continent status before pregnancy was not mentioned [33]. Solans-Domènech et al. [27] carried out 1 cohort study in 1,128 continent nulliparous pregnant women attending the public health service with the aim to estimate the frequency and severity of UI during pregnancy and after delivery. They used the Incontinence Severity Index and the ICIQ-SF questionnaires to measure UI and its severity. They considered the 2002 ICS definition. They found a prevalence rate of UI at the 1st trimester of 8.3% (95% CI 6.6–10), at the 2nd of 31.8% (28.9–34.7) and at the 3rd of 34.8% (31.7–37.9). The most prevalent type of UI was the SUI (up to 79.2% at the 3rd trimester). At an average follow-up of 7 weeks after delivery, UI prevalence amounted to 16.3%. In multivariate analysis, they found the following risk factors of UI in pregnancy: maternal age >35 years [adjusted HR 2.1, 95% confidence interval (CI) 1.0–2.8], initial maternal BMI (adjusted HR 1.3, 95% CI 1.3–2.2), a family history of UI (adjusted HR 1.7, 95% CI 1.3–2.2).

Arrue et al. [28] evaluated 396 nulliparous pregnant women ‘at term’ and 6 months after delivery in order to assess the prevalence of SUI during pregnancy and in the post-partum period. Using the Incontinence Severity Index and the ICIQ-SF questionnaires, they found an SUI prevalence rate at term of 31.2%. The prevalence rates of SUI and MUI 6 months after childbirth were 12.1 and 3%, respectively. In 2001, Kristiansson et al. [31] published the results from a prospective, longitudinal, observational cohort study on all consecutive women attending a Swedish gynecological department in early pregnancy, with the aim to evaluate the possible relationship of reproductive hormones and SUI on UI onset during pregnancy. They used a self-completion institutionalized questionnaire in which SUI was defined as ‘urinary leakage when coughing or lifting’. They evaluated 195 consecutive women and found an increasing SUI rate according to the stage of pregnancy (10% at week 12, 23% at week 24 and 26% at week 36). Thirteen weeks after delivery, the prevalence of SUI was 7.2%. They found that the women reporting SUI during pregnancy showed the lowest relaxin levels, suggesting a role of this hormone in maintaining urinary continence during pregnancy.

Van Brummen et al. [33] reported the results of a prospective cohort study in 344 nulliparous women at 12–18 weeks of gestation and 1 year after childbirth in order to assess the severity of both SUI and overactive bladder (OAB) symptoms. They defined SUI according to the

2002 ICS definitions and used the UDI questionnaire to assess the severity of UI. They found the following UI prevalence rates: at 12 weeks of gestation 7.6% of SUI and 6.7% of OAB with UI, and at 36 weeks of gestation 15.4% of SUI and 16.9% of OAB with UI. One year after delivery, the prevalence rates of SUI and OAB with UI were 10.5 and 14.8%, respectively. Wesnes et al. [32] evaluated 43,279 Norwegian women in pregnancy and found a prevalence of any UI before pregnancy of 26.2% and at 30 weeks of gestation of 58.1%. Taking into account only primiparous women (n = 12,679), they found a prevalence of any UI at 30 weeks of gestation of 40.2% [34]. Six months after delivery, the prevalence of any UI was 31% [29]. They found the following significant risk factors for UI during pregnancy: age >35 years (adjusted OR 1.4, 95% CI 1.3–1.5), ≥1 deliveries (adjusted OR 2.0, 95% CI 1.9–2.1), initial maternal body mass index (adjusted OR 1.7, 95% CI 1.5–1.9). Diez-Itza et al. [30] carried out a longitudinal study in Spanish primiparous women in order to investigate the risk factors involved in SUI occurrence 1 year after the 1st delivery. One hundred three of 352 (29.3%) primiparous women presented with SUI during pregnancy ‘at term’. One year after delivery, the prevalence of SUI was 11.4%, with an incidence of 4.3%.

Conclusion

The main risk factors for UI during pregnancy in primigravidas are maternal age, increased initial body mass index and preexistent UI. Considering all pregnant women, parity represents a further risk factor. The main risk factors for postpartum UI are maternal age, parity, maternal overweight and UI during pregnancy.

Possible Effects of Obstetric Factors on Prevalence and Incidence of UI in Women after Delivery in Europe

Overall, we identified 25 studies investigating the impact of obstetric factors on UI after childbirth: 10 cross-sectional studies [35–44]; 11 cohort studies [45–55]; 3 case-control studies [56–58], and 1 quasi-RCT [34]. Perineal tears [41] and episiotomy [34] do not seem to negatively affect urinary continence status at 1 and 4 years [34, 41] post partum, respectively. A case-control study between women with and without obstetric anal sphincter injuries [57] showed a significantly higher risk of SUI 10 weeks after delivery in women with these injuries (OR 2.65, 95% CI 1.22–5.74), as well as in women with a second-stage labor >50 min (median time; OR 2.32, 95% CI 1.07–5.06). Concerning instrumental vaginal delivery, data are conflict-

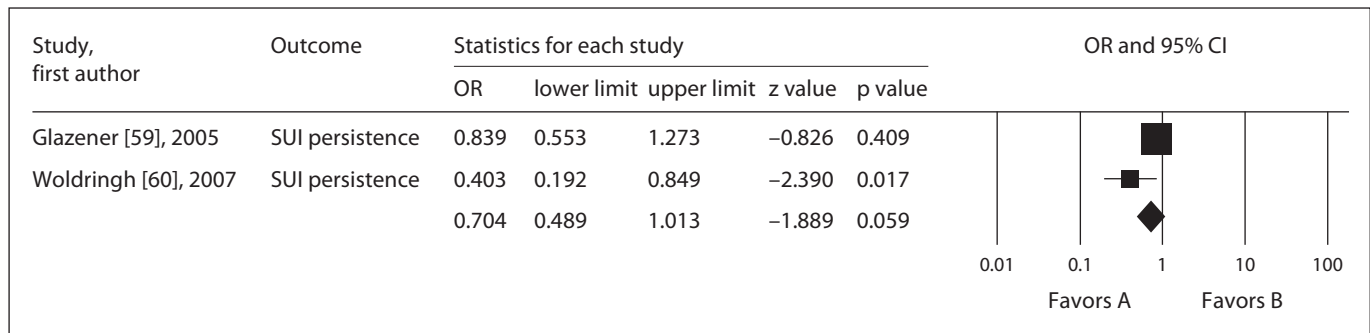


Fig. 2. Pooled analysis of long-term SUI persistence after delivery. A = Postnatal PFMT; B = control.

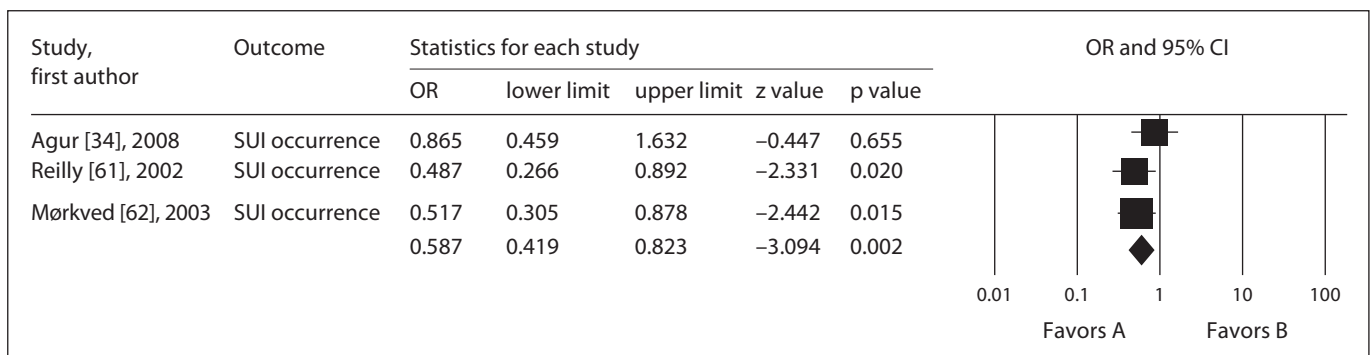


Fig. 3. Pooled analysis of SUI occurrence after delivery. A = Antenatal PFMT; B = control.

ing. Persson et al. [35], who evaluated 251,027 primiparous women, found a significant advantage of spontaneous vaginal delivery versus an instrumental one on later incontinence surgery (OR 0.82, 95% CI 0.70–0.95). The remaining studies did not observe any significant difference. Both instrumental and spontaneous vaginal delivery resulted significantly less protective than cesarean section. In a retrospective cohort study, Demirci et al. [42] found an advantage in performing a cesarean section only for women with a history of cesarean section (OR 0.25, 95% CI 0.07–0.87). We identified 8 RCTs [59–66] and 1 cohort study and nested RCT [67] that investigated the impact of pelvic floor muscle training (PFMT) on UI after delivery. None of these studies showed a significant effect of postnatal PFMT on both mid- (6 months) and long-term UI after pregnancy (up to 6 years). Data on antenatal PFMT were conflicting. Two studies showed a preventive role 3 months after delivery [60, 61], which was not confirmed by the others at a longer follow-up (fig. 2, 3).

Conclusion

Among the many methods proposed to prevent postpartum UI, episiotomy and PFMT were investigated. The results are disappointing or limited. Nine RCTs focused on the impact of PFMT on the improvement in the continence status in women after childbirth. Antenatal PFMT could be helpful in the prevention of postpartum UI in primiparous women without UI during pregnancy. The cesarean section seemed to be followed by less postnatal UI than vaginal delivery, but this advantage disappeared with time and after the second cesarean section (OR 0.47, 95% CI 0.04–5.69).

Appendix: Analytical Framework

Identifying Studies Eligible for Research Questions

(1) Incidence and prevalence of UI in women in Europe and specific UI subtypes

Verification/Selection of Study Eligibility

Criterion 1 – Confirm eligibility of the target population			
Eligible descriptors:			
Adult females in the European Community	Yes	No	
If No – exclude			

Criterion 2 – Confirm eligibility of the outcomes			
Eligible descriptors:			
Prevalence of UI	Yes	No	
Incidence of UI	Yes	No	
If No for all descriptors – exclude			

Criterion 3 – Confirm eligible level of evidence			
Eligible descriptors:			
Large population-based cross-sectional analyses	Yes	No	
Large population-based cohort studies	Yes	No	
If No for all descriptors – exclude			

This evaluation can be possible after reviewing the full text of the articles

(1a) Possible effects of pregnancy and childbirth on UI incidence and prevalence

Criterion 1 – Confirm eligibility of the target population			
Eligible descriptors:			
Adult females in the European Community	Yes	No	
If No – exclude			

Criterion 2 – Confirm eligibility of the outcomes			
Eligible descriptors:			
Prevalence of UI	Yes	No	
Incidence of UI	Yes	No	
If No – exclude			

Criterion 3 – Confirm eligible level of evidence – the studies that examined the association of incident or prevalent UI with pregnancy and childbirth/delivery AND obtained at least one strategy to reduce bias including multivariate analysis, matching or stratification			
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This evaluation can be possible after reviewing the full text of the articles

Eligible descriptors:			
Large population-based cross-sectional analysis	Yes	No	
Large population-based cohort studies	Yes	No	
Clinical trials	Yes	No	
Analysis of Medicare database	Yes	No	
Analysis of registries	Yes	No	
Case-control study	Yes	No	
If No for all descriptors – exclude			

(2) Possible effects of obstetric factors on UI prevalence and incidence in women after delivery in Europe

Criterion 1 – Confirm eligibility of the target population			
Eligible descriptors:			
Adult European females in pregnancy	Yes	No	
Adult European females after childbirth	Yes	No	
If No for all descriptors – exclude			

Criterion 2 – Confirm eligibility of the outcomes			
Eligible descriptors:			
Prevalence of UI	Yes	No	
Incidence of UI	Yes	No	
If No – exclude			

Criterion 3 – Confirm eligible level of evidence – the studies that examined the association between incident or prevalent UI in pregnancy and after delivery with obstetric factors AND obtained at least one strategy to reduce bias including multivariate analysis, matching or stratification			
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Eligible descriptors:			
Large population-based cross-sectional analysis	Yes	No	
Large population-based cohort studies	Yes	No	
Clinical trials	Yes	No	
Analysis of Medicare database	Yes	No	
Analysis of registries	Yes	No	
Case-control study	Yes	No	
If No for all descriptors – exclude			

(3) Possible effect of female UI on economic and human burden in Europe

Criterion 1 – Confirm eligibility of the target population			
Eligible descriptors:			
Adult incontinent females in the European Community	Yes	No	
If No – exclude			

Criterion 2 – Confirm eligibility of the outcomes			
Eligible descriptors:			
Cost of UI	Yes	No	
Cost-effectiveness of UI treatments	Yes	No	
Quality-of-life domains	Yes	No	
Help seeking	Yes	No	
If NO for all descriptors – exclude			

Criterion 3 – Confirm eligible level of evidence – the studies that examined the effect of female UI on the European economic and human burden AND obtained at least one strategy to reduce bias including multivariate analysis, matching or stratification			
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This evaluation can be possible after reviewing the full text of the articles

Eligible descriptors:			
Large population-based cross-sectional analysis	Yes	No	
Large population-based cohort studies	Yes	No	
Clinical trials	Yes	No	
Analysis of Medicare database	Yes	No	
Analysis of registries	Yes	No	
Case-control study	Yes	No	
If No for all descriptors – exclude			

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