Meta-Analysis

Predicting Urinary Incontinence among Postpartum Women

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Abstract

Urinary incontinence (UI) is common during a pregnancy-puerperium period, with a prevalence of 18.6-75% during pregnancy and 6-31% during postpartum. This study aims to review several published studies on which risk factors impact the incidence of UI.The search was conducted on Pubmed®, Cochrane Library®, and Ovid®, resulted in 57, 30, and 11 studies, respectively. We included cross-sectional, cohort, or case-control studies related to this aim. The risk of bias within the study was assessed using the Cochrane and Forrest plot was analysed using Review Manager 5.3. On maternal characteristics, age less than 35 years (OR 0.49; 95% CI 0.35-0.67), primiparity (OR 0.29; 95% CI 0.22-0.38), and BMI <25 kg/m2 (OR 0.67; 95% CI 0.55-0.83) were considered as protective factors. A low level of education (OR 2.16; 95% CI 1.69-2.77) increased the risk of UI, Meanwhile, they showed heterogeneity among studies (I^2>50%). On delivery methods, the most prone to UI was emergency caesarean section followed by instrumental vaginal deliveries, spontaneous vaginal deliveries, and caesarean section. Episiotomy, epidural analgesia, and obstetric anal sphincter injury (OASIS) were not associated with UI (p>0.05). On neonatal parameters, head circumference <35 cm has a protective effect on UI (OR 0.82; 95% CI 0.73-0.93; I^2=0%). Methods of delivery and head circumference will affect postpartum UI according to p-value (p<0.05) and homogeneity among studies (I^2<50%).
Keywords: *urinary incontinence, postpartum, risk factors.*

Prediksi Inkontinensia Urin pada Wanita Pascamelahirkan

Abstrak

Inkontinensia urin (IU) sering dijumpai pada masa kehamilan-nifas dengan prevalensi 18,6-75% selama kehamilan dan 6-31% pascamelahirkan. Studi ini bertujuan untuk mengulas berbagai studii tentang faktor risiko terkait insidens IU.Pencarian dilakukan di berbagai sumber dengan hasil 57 studi di Pubmed®, 30 studi di Cochrane Library®, dan 11 studi di Ovid®. Kriteria inklusi adalah studi potong lintang, kohort atau kasus kontrol. Risiko bias antarstudi dinilai dengan Cochrane dan Forrest plot dianalisis menggunakan Review Manager 5.3. Karakteristik maternal menunjukkan usia <35 tahun (OR 0,49; IK 95% 0,35-0,67), primipara (OR 0,29; IK 95% 0,22-0,38), dan IMT <25 kg/m^2 (OR 0,67; IK 95% 0,55-0,83) sebagai faktor protektif. Tingkat pendidikan rendah (OR 2,16; IK 95% 1,69-2,77) meningkatkan risiko IU. Meskipun demikian, hasil analisis menunjukkan heterogenitas antarstudi (I^2>50%). Berdasarkan metode persalinan, seksio sesarea (SC) emergensi berisiko tinggi terhadap IU diikuti persalinan pervaginam dengan alat, persalinan pervaginam spontan, dan SC. Episiotomi, analgesia epidural, dan trauma obstetrik derajat tinggi tidak berhubungan dengan IU (p>0,05). Pada parameter neonatal, ukuran lingkar kepala <35 cm memiliki efek protektif terhadap IU (OR 0,82; IK 95% 0,73-0,93; I^2=0%). Metode persalinan dan lingkar kepala berpengaruh terhadap IU pascamelahirkan dan homogenitas di antara studi (I^2<50%)
Kata kunci: *inkontinensia urin, pascamelahirkan, faktor risiko.*

Introduction

Urinary incontinence (UI) is common during a pregnancy-puerperium period, with a prevalence of 18.6-75% during pregnancy and 6-31% during postpartum.[1,2] The aetiology of UI is multifactorial, involving pregnancy itself. It is due to hormonal, urethral angle changes, anatomical injury, and forces involving muscle and connective tissue.[1] The risk factors include maternal age greater than 35 years, pre-pregnancy body mass index, increased parity, vaginal delivery, prolonged length of the second stage of labor, and episiotomy.[3,4] Vaginal birth is a major determinant of incontinence in which instrumental deliveries will raise the risk. Nevertheless, there are certain inconsistencies in the analyses of vaginal deliveries and complications because of variations in the study design, sample sign, and length of follow-up for incontinence.[5,6] Meanwhile, caesarean delivery protects against postpartum UI; however, neurophysiologic data suggested that once labor has progressed to the second stage, caesarean delivery is no longer a protective factor for UI.[7]

The incidence of UI during pregnancy and postpartum usually remains for the long term. The most common UI among puerperal women is stress UI (SUI), followed by mixed UI (MUI) and urge UI (UUI).[2,8,9]we included studies that used a randomized controlled trial (RCT This condition influences the decreased quality of life during pregnancy and the puerperal period. Therefore, it is essential to determine risk factors as a prediction for the incidence of UI during pregnancy and the puerperal period.[10] Health providers who know the risk factors can acknowledge the risk factors for preventing the incidence of UI, especially during pregnancy and postpartum. This study aims to review several published studies on which risk factors impact to the incidence of UI.

Methods

We included all cross-sectional, cohort, or case control studies which investigate the risk factors for postpartum UI. Pregnant women without history of previous UI before pregnancy, urinary tract abnormalities or pelvic surgery, no significant medical illness, and no medication consumption which alter urinary tract function. The diagnosis of UI is based on the International Consultation on Incontinence Questionnaire–Urinary Incontinence Short Form (ICIQ–UISF) or interview focusing urinary incontinence as defined by the International Continence Society (involuntary loss of urine that is a social or hygienic problem).[11] The studies included in our review should consist of two groups: urinary incontinence and continence/ control.

We assessed several risk factors related to UI including maternal, labour, and neonatal characteristics. Maternal characteristics included age, level of education, parity, pre-pregnancy body mass index (BMI) pre-pregnancy, smoking habit, and constipation. Meanwhile, labour risk factors consisted of delivery methods, epidural analgesia, episiotomy, and obstetric anal sphincter injuries (OASIS). Neonatal parameters are birth weight and head circumference.

We imposed no language or other restrictions on the beginning of searches. The search was conducted on Pubmed®, Cochrane Library®, and Ovid®. In PubMed, the investigation included keywords using the MeSH, namely ("Urinary Incontinence/ complications" OR "Urinary Incontinence/diagnosis") AND "Pregnancy" AND "Postpartum Period". Meanwhile, in Cochrane, the MeSH descriptor consisted of [Urinary Incontinence] AND [Pregnancy] AND [Postpartum Period]. The author used keywords of (*Urinary Incontinence/co, di [Complications, Diagnosis] AND pregnancy AND exp postpartum Period/) in Ovid. Of the search strategy above performed on June 10th 2018, there were 57, 30, and 11 studies in Pubmed®, Cochrane Library®, and Ovid® database, respectively. The articles were screened using the criteria consisting of abstracts answering the clinical question, written in the English language, full-text paper availability, and omitting all duplication papers.

Our search generated a list of abstracts. Two review authors (RS and BIS) independently screened these abstracts. Studies that were not relevant were excluded at this stage. The full-text articles of relevant studies identified were obtained. If there was any uncertainty on the eligibility of the studies based on title and abstract, the entire paper was obtained and reviewedby the same two review authors. The search methods and strategies used for this review are given in Figure 1.

The risk of bias within the study was assessed using the Cochrane risk of bias table. The risk factors were based on questionnaires or interviews written in each study. We standardized into categorical variables for risk factors based on previous theory. Heterogeneity was assessed through the score of I^2, which consisted of I^2<50% as homogeneity among studies.Using the risk of bias form, we assessed for data that should have been collected but were not reported.

Results

The best study design to answer thequestion is case-control or cohort. In this review, we found 12 studies related to our questions; however, three studies were excluded due to language matters. The flow of literature through the assessment process for this review's update is shown in Table 1.

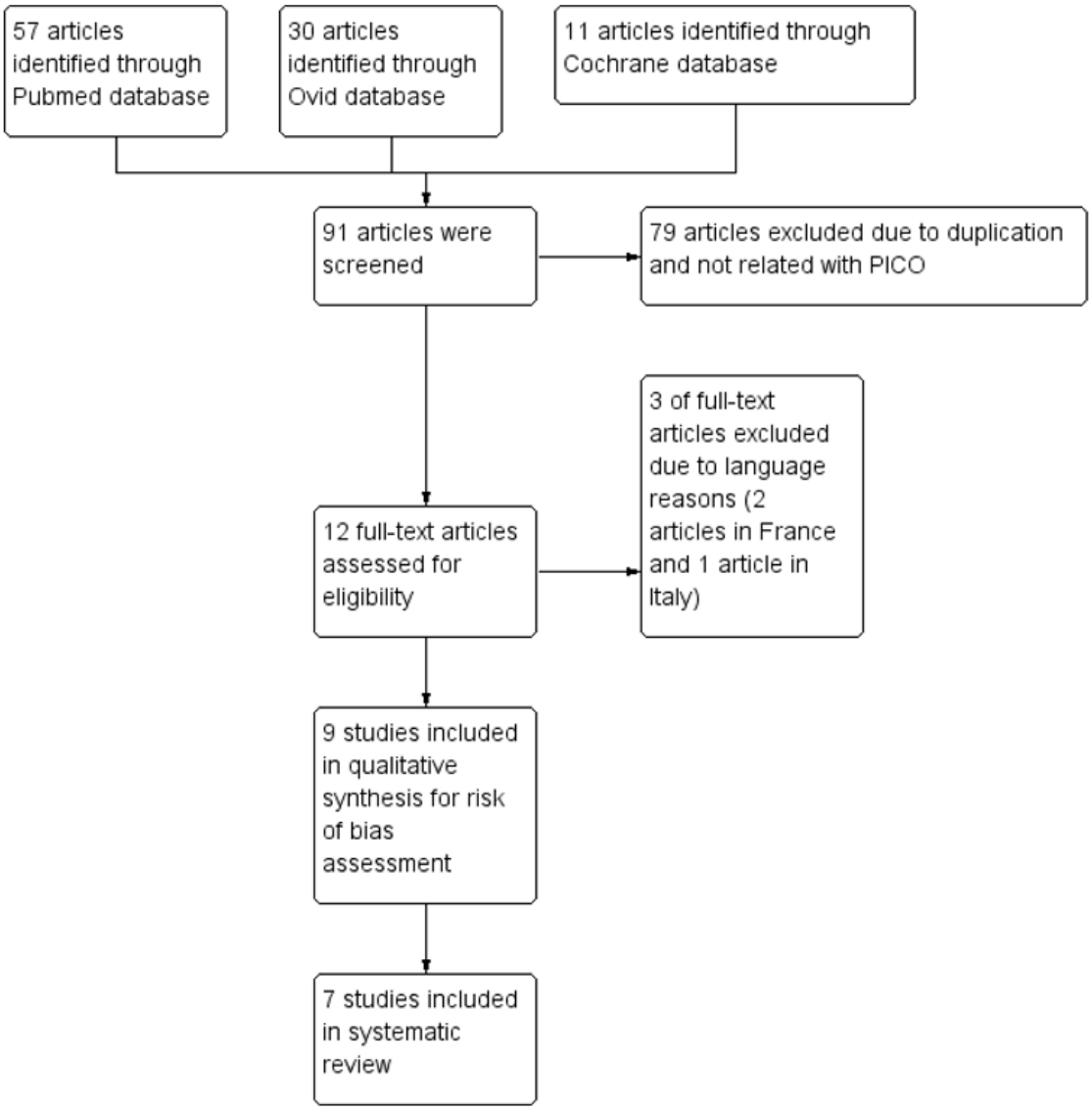

Figure 1. The Search Strategy in this Review

Table 1. Characteristics of Studies Included in This Meta-Analysis

Study	Methods	Participants	Assessment	Outcomes
de Oliveira et al[12]	Descriptive, cross-sectional design	495 women: 352 women (71%) had UI during the last 4 weeks of pregnancy	The questionnaire based on ICIQ-SF, which was adapted and validated for Brazilian Portuguese	Risk factors for postpartum UI: level of education (p<0.001), race (p=0.005), parity (p<0.001), type of birth (p<0.001), and weight (p<0.001).
Farrell et al[7]	Prospective survey	595 women delivered at the hospital: 147 (25%) caesareans, 333 (56%) spontaneous vaginal deliveries, 115 (19%) instrumental deliveries	The questionnaire consisted of urinary, faecal, flatal incontinence – clarified by a nurse. The severity of urinary incontinence was classified as mild (precipitated only by vigorous exercise), moderate (precipitated by a strong cough or sneeze), or severe (precipitated by daily activities).	UI rates at 6 months were 11 of 115 (10%) caesarean, 50 of 233 (22%) spontaneous deliveries, 24 of 74 (33%) forceps deliveries. Instrumental deliveries increased the risk of UI compared to caesarean (RR 3.1) and spontaneous vaginal delivery (RR 1.5). Spontaneous vaginal delivery was associated with higher risk for UI than caesarean delivery (RR 2.1). Of risk factors, only the duration of the passive 2nd stage was significant to UI (p=0.04).
Kok et al[13]	Descriptive, cross-sectional design	287 pregnant women	Investigator-developed questionnaire that incorporated two validated instruments, ICIQ-SF and I-QOL scale	Risk factors for women with UI: age (OR 3.833), parity (OR 2.539); third vs first trimester (OR 3.206).
Leroy et al[10]	Case-control study	344 puerperal women (77 cases and 267 controls)	ICIQ-SF validated in Portuguese	Risk factors for postpartum UI: UI during pregnancy (OR 12.82, p<0.0001), multiparity (OR 2.26, p=0.0094), gestational age at birth greater or equal to 37 weeks (OR 2.52, p=0.0199) and constipation (OR 1.94, p=0.0345).
Solans et al[9]"	Cohort study	1,128 continent pregnant nulliparous women - 39.1% diagnosed as UI, > 50% suffered from SUI and 30% UUI in postpartum period	A self-administered questionnaire in each trimesters and the postpartum visit (average of 7 weeks) - 2 adapted and validated into Spanish questionnaires, the Incontinence Severity Index and short version of the ICIQ.	Risk factors for UI: pregnant women aged more than 35 years, overweight or obese at baseline, and those with a family history of UI.
Torkestani et al[14]	Case-control study	250 patients divided into two groups	A developed questionnaire: age, employment, educational level; BMI; history of pregnancies (including gravidity and parity); fetal birth weight; delivery method; whether they had a previous episiotomy; whether they were stress incontinent (measured as 'yes' or 'no'); the presence and severity of cystocele and rectocele.	Risk factors for UI: Increased age (p<0.001) and BMI (p<0.05; OR 1.673; 95% CI 1.022-2.731)
Wesnes et al[15]	Prospective population-based pregnancy cohort study	7,561 women - incidence of UI 6 months postpartum was 20.7%	Postal questionnaires based on the terminology of the International Continence Society at six-time points; from week 15 in pregnancy to 3 years after birth	Women with spontaneous delivery, higher birthweight, birthweight > 4,180 g and large head circumference (35-37 cm) were associated with a higher risk of UI 6 months postpartum with OR 1.4, OR 1.6, and OR 1.3; respectively.

Included Studies

The studies included in the meta-analysis are shown in Table 1. There were seven studies included in our systematic review consisting of 3 cross-sectional/ survey, 2 case control, and 2 cohort studies.

Exclusion Study

Two studies by Hernandez et al[16] and Zhu et al[17] were considered for inclusion. Nevertheless, they did not show the frequency of their baseline data, so we could not include it in our meta-analysis.

Risk of Bias Included Studies

Figure 2 summarizes the risk of bias in each study. Most of studies revealed low risk of bias except for bias in longer term outcomes more than 6 weeks. It was because the follow up among studies were still different.

Risk Factors

Of studies included in meta-analysis, there were several risk factors contributing to postpartum UI (Table 2). It showed that smoking, methods of delivery (SVD vs IVD; IVD vs CS; emergency CS vs IVD), epidural analgesia, birthweight <4,000 grams, and head circumference <35 cm were low heterogeneity (I^2 = 0%).

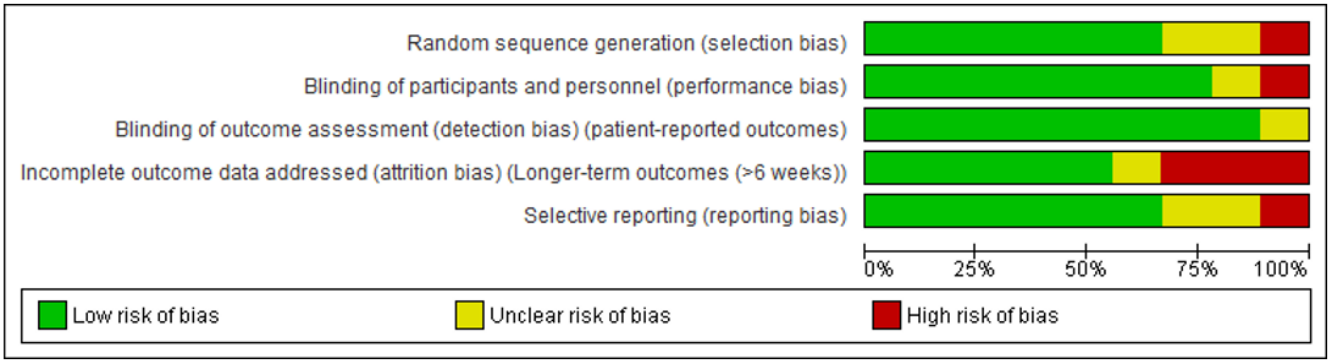

Figure 2. Summary of Bias Risk Studies Included in The Meta-Analysis

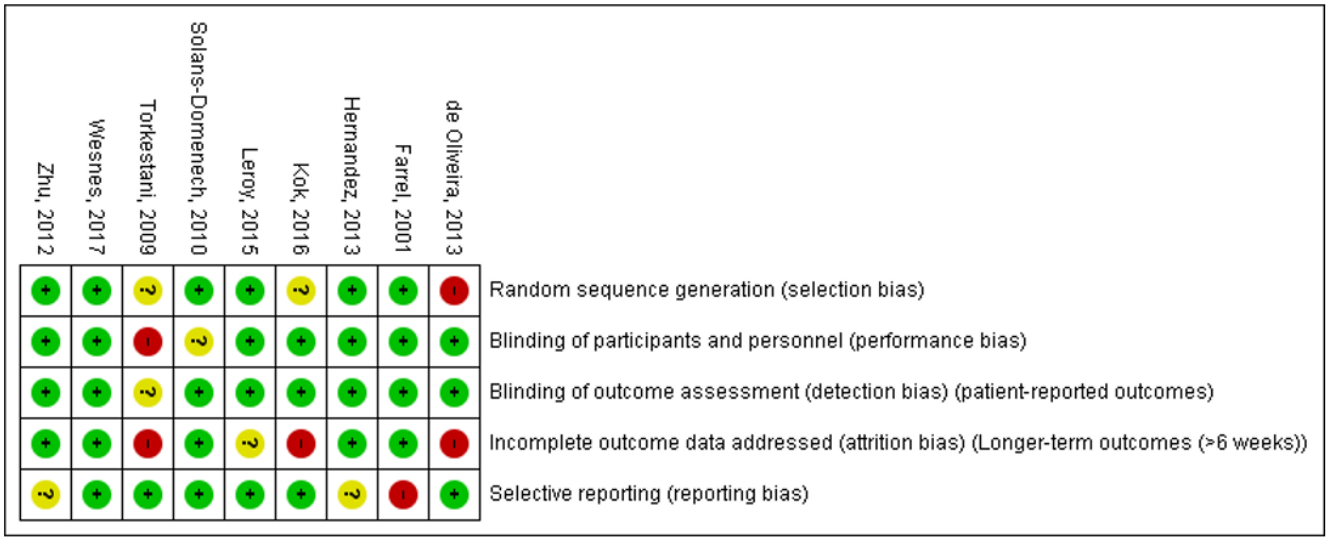

Figure 3. Risk of Bias for Each Study

Table 2. Risk Factor Characteristics Contributing to Postpartum UI

Characteristics	OR	95% CI	p	I^2
Maternal				
Age <35 years old	0.49	0.35-0.67	<0.001	78%
Basic/primary education	2.16	1.69-2.77	<0.001	91%
Primiparity	0.29	0.22-0.38	<0.001	73%
BMI pre-pregnancy <25 kg/m2	0.67	0.55-0.83	<0.01	62%
Smoking	0.82	0.53-1.26	0.37	0%
No chronic constipation	1.29	0.96-1.74	0.09	80%
Obstetrics				
Methods of delivery				
CS vs SVD	0.34	0.29-0.40	<0.001	81%
SVD vs IVD	0.84	0.74-0.96	0.01	0%
IVD vs CS	3.73	3.00-4.64	<0.01	0%
Emergency CS vs SVD	2.92	2.34-3.64	<0.01	62%
Emergency CS vs IVD	3.58	2.78-4.61	<0.01	0%
Episiotomy	1.12	0.98-1.28	0.09	86%
Epidural analgesia	1.00	0.87-1.15	0.99	0%
OASIS	0.98	0.50-1.92	0.94	N/A
Neonatal				
Birthweight <4000 g	0.94	0.77-1.14	0.52	0%
Head circumference <35 cm	0.82	0.73-0.93	0.002	0%

OR: odds ratio; CI: confidence interval
BMI: body mass index; CS: caesarean section; SVD: spontaneous vaginal delivery; IVD: instrumental vaginal delivery; OASIS: obstetrics anal sphincter injuries

Discussion

The limitation of this review was that no proceedings of conferences were included. Several studies had different terminology for the postpartum UI follow-up. Only Farrel et al[7] and Wesnes et al[15] studies followed the patients up to 6 months postpartum. Meanwhile, de Oliveira et al[12] conducted follow-up only immediately postpartum; Solans et al9 stated the follow-up was based on the patients with an average of 7 weeks as the end of the puerperal period; Leroy et al[10] investigated the UI up to 90 days postpartum. In the meantime, Torkestani et al[14] did not mention the length of follow-up and Kok et al[13] conducted a cross-sectional study design when the women were pregnant.

This study revealed that risk factors contributing to UI could be divided into maternal, obstetrics, and neonatal characteristics. Age less than 35 years, high level of education, primiparity, and BMI <25 kg/m2 were considered protective factors. Increased age was related to the incidence of UI corresponding to Kok et al[13] and Zhu et al[17] studies. Groutz et al[18] stated that maternal age more than 30 years at first delivery had significant risk factors to be UI, especially SUI. Several studies also revealed parity as a risk factor of UI.[13,19] High BMI indirectly increased the risk with high birth weight and forceps delivery;[20] therefore, BMI is expelled as an independent risk factor for UI. The physiological changes of pregnancy may result in diminished pelvic floor muscle strength, contributing to UI; thus, experts suggest pregnant women muscle exercise regularly to alleviate urine loss.[2] High educational level can be a protective factor; however, it showed inconsistent results among studies. High education is related to the increase of UI awareness because UI occurs during pregnancy and after delivery.[12] In pregnancy, UI can be reduced by frequent pelvic floor muscle exercise with maximal voluntary contraction during pregnancy.[21,22] Apart from that, education is corresponding to nutrition during pregnancy. Skeletal muscle tissue is sensitive to protein deficiency, leading to reduced fiber and changes in the morphological, metabolic, and contractile of skeletal muscle fibers; thus, protein deficiency is more prone to UI.[12]

Based on delivery methods, the most prone to UI was emergency CS, followed by instrumental vaginal deliveries, spontaneous vaginal deliveries, and caesarean section; as seen in the p-value and homogeneity among studies. Previous studies revealed that pregnancy can increase the risk

of UI; however, Torkestani et al[14] explained that elective CS had a significant protective role against UI. Altman et al[23] concluded that vaginal delivery is an independent risk factor associated with SUI symptoms and UUI, regardless of maternal age or gravidity. Goldberg et al[24] also demonstrated that vaginal delivery is a significant risk factor for stress incontinence among multiparous women, and caesarean section can be a protective factor. The reason vaginal delivery increases the risk is prolonged pressure from the fetus on the pelvic floor may cause neuropraxia; thus, the pudendal nerve, which innervates the external urethral sphincter, is vulnerable to damage. Secondly, trauma to muscles, fascia, and connective when the fetus passes out of the vaginal canal will affect the pelvic floor and urethral support ending in UI.[25,26]. Other obstetrics risk factors, such as episiotomy, epidural analgesia, and OASIS, were not associated with UI. It is difficult to separate the combination of maternal characteristics and obstetric risk factors as underlying risks for UI; therefore, we should combine risk factors in more extensive studies to see how they give information for decision-making in the clinical situation.

On neonatal parameters, head circumference <35 cm has a protective effect on UI, as seen in the p-value and homogeneity among studies. Wesnes et al[15] stated that newborns with higher birth weight and/or large head circumference have higher risk for UI 6 months postpartum. The combination of high birthweight and head circumference seemed to interact and enhance the chance of UI. High birth weight and head circumference increase the risk of episiotomy, resulting in incontinence. Episiotomy cannot be ruled out based on indication. Therefore, clinicians should balance the need for episiotomy in women with large babies for safe delivery. For applicability, this meta-analysis criticizes studies in several developing and developed countries; thus, it can be applicable for international practice.

Conclusion

This meta-analysis concludes that methods of delivery and head circumference will affect postpartum UI according to p-value and homogeneity among studies.

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