Association between Overactive Bladder with Pelvic Organ Prolapse: Systematic Review

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ABSTRACT

Background: Overactive bladder (OAB) and pelvic organ prolapse (POP) are common coexisting pelvic floor disorders, though their relationship is not fully understood.

Objective: To synthesize evidence on the POP–OAB association, focusing on OAB prevalence in POP, compartment-specific links, treatment outcomes, and predictors of persistent symptoms.

Methods: A systematic search of PubMed, Embase, Scopus, Web of Science, and Cochrane Library (2021–2025) identified studies on women with POP and OAB using validated measures. Two reviewers independently screened, extracted data, and assessed bias (Newcastle-Ottawa Scale, JBI checklists). Narrative synthesis was used due to heterogeneity.

Results: Fifteen studies (seven prospective cohorts, four retrospective, two case-control, two cross-sectional) were included. OAB prevalence in POP was markedly elevated (up to 70%). Anterior and apical prolapse showed stronger OAB associations than posterior. POP treatment improved OAB symptoms in 58–89% of patients, with anterior/apical repair yielding higher resolution (e.g., 82% for frequency) versus posterior (63%). Persistent OAB predictors included preoperative detrusor overactivity (OR 12.2), urgency incontinence (OR 3.8), BMI >25 (OR 1.8), and advanced anterior prolapse (OR 2.28). De novo OAB occurred in 1–5% postoperatively.

Conclusion: A significant association exists between POP and OAB, especially for anterior/apical defects. Most patients experience OAB improvement after POP treatment. Clinicians should routinely assess OAB in POP patients and consider POP repair as part of OAB management. Future research needs standardized prospective studies to clarify mechanisms and build predictive models for personalized care.

Keywords: Pelvic organ prolapse; Overactive bladder; Urinary urgency; Lower urinary tract symptoms; Detrusor overactivity; Anterior vaginal wall prolapse.

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INTRODUCTION

Overactive bladder (OAB) is a highly prevalent and debilitating lower urinary tract condition characterized by urinary urgency, usually accompanied by frequency and nocturia, with or without urgency urinary incontinence, in the absence of urinary tract infection or other obvious pathology [1]. The global burden of OAB is substantial, with a recent systematic review and meta-analysis encompassing 53 studies and 610,438 participants estimating the worldwide prevalence at 20%, with higher rates observed among women at 21.9% compared to men [1]. OAB symptoms become more prevalent with age, occurring in approximately 15% of women aged 20–29 years and increasing to 21% among women aged >70 years [1]. The condition substantially impairs quality of life, with affected women experiencing significant psychological distress, social isolation, sleep disturbances, and decreased productivity [2].

Pelvic organ prolapse (POP) represents another highly prevalent pelvic floor disorder, defined as the descent of one or more of the anterior vaginal wall, posterior vaginal wall, the apex of the vagina (uterus or vaginal cuff), or the perineum [3].

POP affects 40–50% of parous women, with prevalence estimates varying widely depending on the definition used—ranging from 3–6% when defined by symptoms to up to 50% when based upon vaginal examination [4]. The global burden of POP has increased in absolute numbers, with global cases rising from approximately 8.4 million in 1990 to 14.0 million in 2021 [4]. Risk factors for POP include vaginal childbirth, aging, obesity, chronic coughing, and pelvic surgery [3]. Given the overlapping anatomical and functional relationships between the pelvic organs, it is perhaps not surprising that OAB and POP frequently coexist. Community- and hospital-based studies have consistently demonstrated that the prevalence of OAB symptoms is significantly greater in patients with POP than in those without POP [5].

The relationship between POP and OAB has been the subject of considerable research interest, yet the exact nature and strength of this association remain incompletely understood [6]. A systematic review of lower urinary tract symptoms occurring with POP concluded that while the prevalence of both conditions is high, they occur more frequently together than can be explained by chance alone [5]. It appears that POP is in some women causative of OAB symptoms, as in many women correction of the POP resolves the bladder symptoms [6]. However, not all women experience resolution of their OAB symptoms, and some may develop de novo OAB after prolapse repair, indicating that the relationship is complex and multifactorial [7]. A systematic literature review similarly confirmed that women with pelvic organ prolapse very often have OAB, with prolapse surgery recommended when the prolapse is symptomatic [5]. Furthermore, recent systematic reviews and meta-analyses have quantified these outcomes, demonstrating that POP surgery resolves OAB symptoms in approximately 58% of patients, with anterior and apical compartment repair associated with significantly superior OAB resolution compared to posterior repair [8].

The pathophysiological mechanisms underlying the association between POP and OAB have been the subject of extensive investigation [7]. The most commonly accepted theory proposes that POP causes increased bladder outlet obstruction or resistance, leading to secondary detrusor overactivity and OAB symptoms [7]. This hypothesis is supported by the observation that correction of POP through surgical repair or pessary placement improves voiding function and is associated with a reduction in OAB symptoms [8]. Several other mechanisms have also been proposed, including activation of bladder stretch receptors from poor anterior vaginal wall support, anatomical distortion compromising pelvic innervation, coinciding urethral sphincter incompetence, and potential neurogenic or myogenic alterations [8]. The review by **de Boer *et al.*** concluded that bladder outlet obstruction is likely the most important mechanism by which POP induces OAB symptoms and detrusor overactivity signs [7].

Despite the growing body of evidence supporting an association between POP and OAB, several important questions remain unanswered [9]. It remains unclear whether the presence of OAB symptoms depends on the specific prolapsed compartment and/or the stage of the prolapse [7,9]. This systematic review aims to address these knowledge gaps by comprehensively synthesizing the available evidence on the association between POP and OAB, with particular focus on the prevalence of OAB in women with POP.

METHODOLOGY

Registration and Protocol

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [10]. The systematic review methodology adhered to the standards recommended by the Cochrane Handbook for Systematic Reviews of Interventions, ensuring rigor and reproducibility in all stages of the review process [11].

Search Strategy

A comprehensive and systematic literature search was conducted to identify all relevant studies examining the association between pelvic organ prolapse (POP) and overactive bladder (OAB) symptoms. The search was performed across multiple electronic databases including PubMed/MEDLINE, Embase, Scopus, Web of Science, and the Cochrane Library. The search strategy was developed using a combination of Medical Subject

Headings (MeSH) terms and free-text keywords related to the key concepts of POP and OAB. The specific search terms included combinations of "pelvic organ prolapse," "POP," "cystocele," "rectocele," "uterine prolapse," "vaginal vault prolapse," "enterocele," "overactive bladder," "OAB," "urinary urgency," "urinary frequency," "nocturia," "urgency urinary incontinence," "detrusor overactivity," "lower urinary tract symptoms," and "LUTS." Boolean operators (AND, OR) were used to combine search terms appropriately. The search was restricted to studies published in the English language and conducted over a five-year period from 2021 to 2025 to ensure the inclusion of contemporary evidence. The search strategy was adapted for each database according to its specific syntax and indexing system. Additionally, the reference lists of included studies and relevant review articles were manually screened to identify any additional studies that may have been missed by the electronic database searches.

Eligibility Criteria

Studies were considered eligible for inclusion in this systematic review if they met the following pre-defined criteria based on the PICOS framework (Population, Intervention/Exposure, Comparison, Outcome, Study Design). The population of interest included women with pelvic organ prolapse, regardless of POP stage or compartment, as diagnosed by standardized clinical assessment using the Pelvic Organ Prolapse Quantification (POP-Q) system or other validated clinical criteria. The intervention or exposure of interest was the diagnosis or treatment of POP, including surgical repair (vaginally, laparoscopically, or robotically), conservative management with pessary, or pelvic floor muscle training. The primary outcome was the assessment of OAB symptoms measured using validated and reliable instruments such as the Pelvic Floor Distress Inventory (PFDI-20), Urogenital Distress Inventory (UDI-6), Overactive Bladder Questionnaire Short Form (OAB-q SF), Overactive Bladder Symptom Score (OABSS), or other validated questionnaires and clinical criteria. The comparison groups varied depending on the study design and could include women with POP without OAB, women undergoing different types of POP treatment, or comparisons between different POP compartments. Regarding study design, we included original research articles including prospective cohort studies, retrospective cohort studies, case-control studies, cross-sectional studies, and randomized controlled trials. We excluded case reports, case series with fewer than 10 participants, reviews, editorials, letters to the editor, commentaries, conference abstracts without full-text publications, studies not published in English, and studies that did not report original data on the association between POP and OAB. Studies were also excluded if they did not use validated outcome measures for OAB assessment or if they focused exclusively on other lower urinary tract symptoms without reporting specific OAB outcomes.

Study Selection and Screening Process

The study selection process was conducted following the PRISMA guidelines and involved two stages: title and abstract screening, followed by full-text review. All identified records from the electronic database searches were exported to the Rayyan systematic review software (Rayyan Systems Inc., Cambridge, MA, USA), a web-based platform designed to facilitate the screening and selection process for systematic reviews. Duplicate records were identified and removed using Rayyan's automated duplicate detection algorithm, followed by manual verification. Two independent reviewers (names withheld for blinding) performed the title and abstract screening to assess eligibility based on the pre-defined inclusion criteria. During this initial screening phase, reviewers evaluated each record's title and abstract to determine whether the study potentially met the eligibility criteria. Any disagreements between the two reviewers were resolved through discussion and consensus, with a third reviewer available for adjudication if consensus could not be reached. Following the title and abstract screening, the full texts of all potentially eligible studies were retrieved and reviewed in detail. The same two independent reviewers conducted the full-text screening, applying the eligibility criteria more rigorously to confirm inclusion or exclusion. Reasons for exclusion at the full-text stage were documented and reported in the PRISMA flow diagram. Inter-rater reliability between the two reviewers was assessed using Cohen's kappa coefficient to evaluate the degree of agreement. The screening process was conducted independently and blindly, with reviewers not having access to the other reviewer's decisions until the process was completed for each stage. A PRISMA flow diagram was constructed to illustrate the study selection process, including the number of records identified, screened, assessed for eligibility, and ultimately included in the systematic review [10].

Data Extraction

Data extraction was performed independently by two reviewers using a standardized, pilot-tested data extraction form developed specifically for this systematic review. The data extraction form was designed to capture all relevant information from each included study in a systematic and consistent manner. Prior to full data extraction, the form was piloted on three randomly selected studies to ensure completeness and usability, with refinements made as needed. The extracted data were organized into structured tables to facilitate synthesis and comparison across studies. For each included study, the following data were extracted: study characteristics

including first author, publication year, country of origin, study design, study setting, and sample size; participant demographics including age, body mass index, menopausal status, parity, and POP-Q stage; intervention or exposure details including type of POP treatment (surgical technique, conservative management) and POP compartment (anterior, apical, posterior); outcome measures including OAB assessment tools used, definition of OAB, timing of outcome assessment, and duration of follow-up; and key findings including prevalence of OAB, rates of improvement or resolution, predictors of persistent OAB, and any relevant secondary outcomes such as biomarker measurements or urodynamic findings. Any disagreements between the two reviewers during data extraction were resolved through discussion and consensus, with a third reviewer consulted if necessary. Where data were not explicitly reported or were unclear in the published article, the corresponding authors were contacted via email to request additional information; if no response was received within four weeks or if the data remained unavailable, these data points were recorded as "Not Reported" (NR) in the data extraction tables. The extracted data were then cross-verified by both reviewers to ensure accuracy and completeness before being entered into the synthesis tables.

Risk of Bias Assessment

The methodological quality and risk of bias of the included studies were assessed independently by two reviewers using validated and appropriate tools based on the study design of each included study. For cohort studies (both prospective and retrospective), the Newcastle-Ottawa Scale (NOS) was employed, which is a widely validated and recommended tool for assessing the quality of non-randomized studies in systematic reviews and meta-analyses. The NOS evaluates three major domains with a maximum score of 9 stars: selection of participants (representativeness of the exposed cohort, selection of the non-exposed cohort, ascertaiNRent of exposure, and demonstration that the outcome of interest was not present at start of study), comparability of cohorts (control for confounding factors), and outcome assessment (assessment of outcome, adequacy of follow-up duration, and completeness of follow-up). Studies were categorized based on their NOS scores: scores of 7–9 stars indicated low risk of bias, scores of 4–6 stars indicated moderate risk of bias, and scores of 0–3 stars indicated high risk of bias. For case-control studies, the NOS was similarly applied, assessing the following domains: selection (adequacy of case definition, representativeness of cases, selection of controls, definition of controls), comparability (control for confounding), and exposure (ascertaiNRent of exposure, same method of ascertaiNRent for cases and controls, and non-response rate). For cross-sectional studies, the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies was utilized, which evaluates sample frame, study subjects, exposure and outcome measurement, and statistical analysis. For descriptive cross-sectional studies, the JBI Checklist for Prevalence Studies was used, assessing sample frame, sampling method, sample size, study subjects, data analysis, response rate, and outcome measurement. The risk of bias assessment was performed independently by the two reviewers, with any disagreements resolved through discussion and consensus, and a third reviewer available for adjudication if needed. The results of the risk of bias assessment were presented in a summary table and considered during the interpretation and synthesis of the findings.

Data Synthesis and Analysis

Due to the expected heterogeneity in study designs, populations, interventions, and outcome measures across the included studies, a narrative synthesis approach was planned and implemented. The synthesis was organized around the key themes identified from the research question, including the prevalence of OAB in POP populations, the association between different POP compartments and OAB symptoms, the improvement of OAB following POP treatment, and predictors of persistent OAB symptoms. For each theme, findings from individual studies were summarized and presented in structured tables to facilitate comparison. Where studies provided sufficient and comparable quantitative data (such as rates of improvement, odds ratios, relative risks, or mean differences with confidence intervals), these were extracted and reported. However, given the heterogeneity in outcome measures, follow-up durations, and assessment tools, a meta-analysis was not considered appropriate, as pooling data would not yield clinically meaningful results. Instead, the narrative synthesis provided a comprehensive overview of the evidence, highlighting consistencies and discrepancies across studies. The synthesis was organized by study characteristics (geographical region, study design, sample size) and by key findings related to the association between POP and OAB. For studies reporting predictors of OAB outcomes, findings were tabulated and summarized according to the identified predictor variables (clinical, demographic, and urodynamic). The strength of evidence was assessed based on the consistency of findings across studies, the methodological quality of the studies (as determined by the risk of bias assessment), and the precision of effect estimates where available. The narrative synthesis was presented in a structured manner, with findings organized by theme and supported by direct references to the included studies. No formal statistical pooling or meta-analysis was performed

due to the heterogeneity in study designs, populations, interventions, and outcome measures, as well as the inability to extract standardized effect sizes from all included studies.

RESULTS

PRISMA flow diagram illustrates the systematic screening and selection process for studies included in this review. A total of 554 records were initially identified through database searches, of which 397 duplicate records were removed, leaving 157 records for screening. Following title and abstract screening, 103 records were excluded based on irrelevance to the research question, resulting in 54 reports sought for retrieval. Of these, 29 reports could not be retrieved, leaving 25 full-text reports assessed for eligibility. After comprehensive full-text evaluation, 10 reports were excluded for the following reasons: wrong outcome (n=7), wrong population (n=2), and abstract only without full-text data (n=1). Consequently, a total of 15 studies met the eligibility criteria and were included in the final systematic review for data extraction and synthesis.

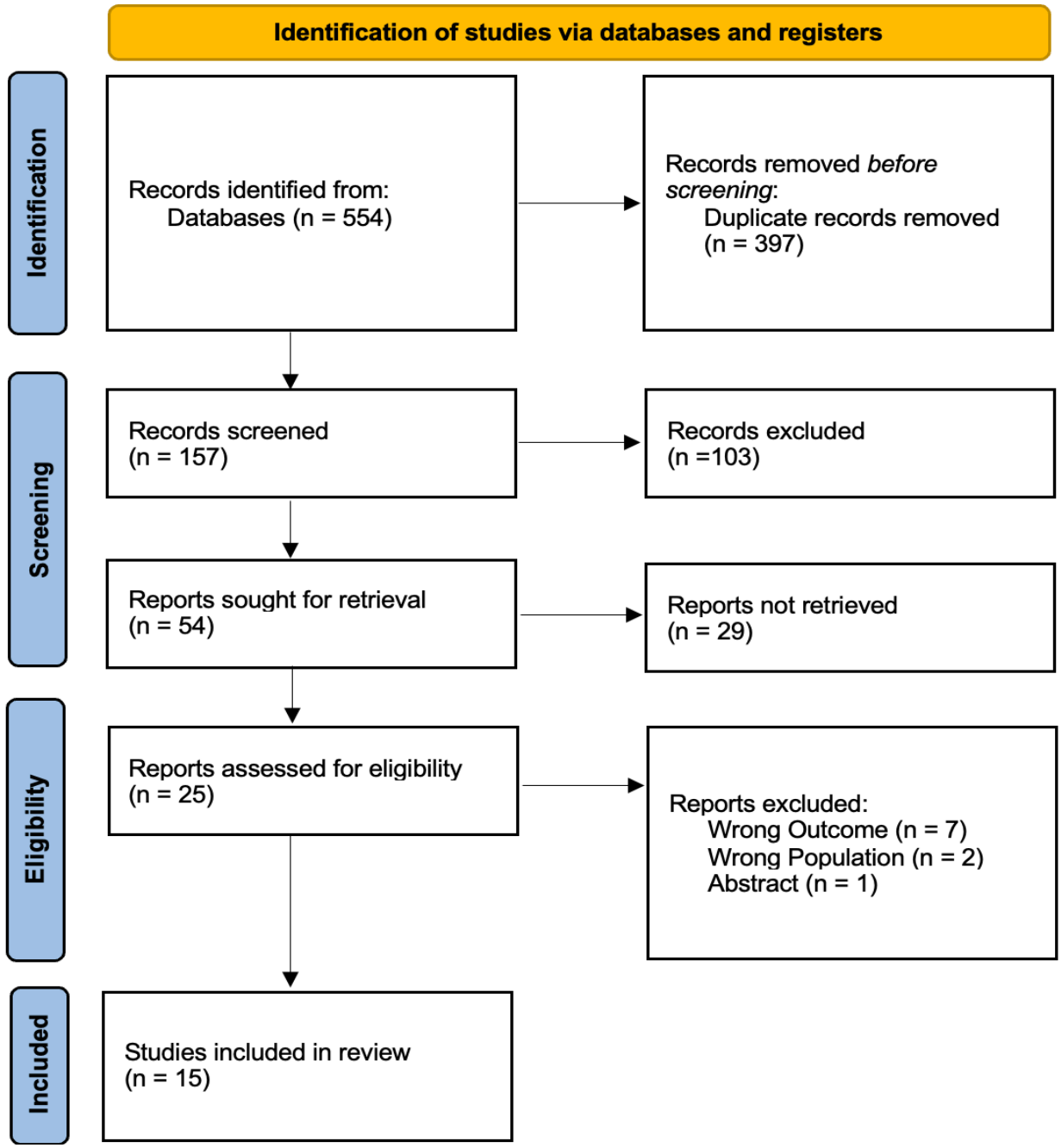

Figure 1: PRISMA Flow Diagram of Study Selection Process.

Table 1 summarizes the demographic characteristics and study designs of the 15 included studies. The studies were conducted across diverse geographical locations, including Finland [12], the United States [13, 14, 16, 17], Israel [15], Thailand [18, 20, 25], Taiwan [19], Mexico [21], Japan [22], Italy [23], Turkey [24], and Pakistan [26]. Regarding study design, the majority were prospective cohort studies (n=7) [12- 14, 16, 19, 22, 25], followed by retrospective cohort studies (n=4) [15, 17, 18, 23], case-control studies (n=2) [20, 24], and cross-sectional studies (n=2) [21, 26]. Sample sizes varied considerably, ranging from 27 participants in the pessary study by **Yaranun *et al.*** [25] to 58,841 Medicare beneficiaries in the large retrospective cohort by **Shatkin-Margolis *et al.*** [17].

The study by **Karjalainen *et al.*** [12] also had a substantial sample of 2,933 women from the Finnish population. The target populations were predominantly women with symptomatic pelvic organ prolapse undergoing either surgical repair or pessary treatment, with some studies specifically focusing on anterior/apical prolapse [13, 14] or advanced stages of prolapse (stage III–IV) [15]. One study uniquely examined primiparous women within one year after vaginal delivery [16]. Demographic data such as mean age, BMI, menopausal status, and parity were not consistently reported across all abstracts, with many studies omitting these details entirely, as indicated by "NR" (Not Reported) in the table.

Table 2 presents the core objectives, outcome measures, and key findings of each included study, organized to highlight the evidence for the association between POP and OAB. The most frequently used assessment tools for OAB symptoms were the Pelvic Floor Distress Inventory-20 (PFDI-20) [12, 15, 26], the Overactive Bladder Questionnaire Short Form (OAB-q SF) [13], the Urogenital Distress Inventory-6 (UDI-6) [13, 14], and the Overactive Bladder Symptom Score (OABSS) [19, 22, 25]. Follow-up durations ranged from 3 months [13, 21, 25] to 24 months [12, 26], with some studies not specifying a follow-up period [18, 20, 23, 24]. The key findings consistently demonstrate that OAB symptoms improve following POP treatment.

For instance, **Karjalainen *et al.*** [12] reported that bothersome frequency resolved in 82% of women after anterior/apical surgery compared to 63% after posterior compartment surgery. Similarly, **Abrams *et al.*** [14] found that 79.5% of patients experienced a clinically significant reduction in OAB symptoms after anterior/apical repair. Predictors of persistent OAB symptoms were identified in several studies; **Padoa *et al.*** [15] found that preoperative detrusor overactivity (OR 12.2), urgency urinary incontinence (OR 3.8), and BMI >25 kg/m² (OR 1.8) were significant predictors of persistent urgency. Furthermore, **Saraluck *et al.*** [20] demonstrated that advanced anterior compartment prolapse was the only factor significantly associated with OAB (OR 2.28), reinforcing the importance of the anterior compartment in OAB pathophysiology.

The study by **Hendrickson *et al.*** [16] extended these findings to the postpartum period, showing that both enlarged genital hiatus (aRR 1.5) and anatomic POP (aRR 1.8) were associated with OAB at one year postpartum. Notably, studies examining urinary biomarkers, such as nerve growth factor (NGF), yielded mixed results; while **Yildiz *et al.*** [24] found significantly higher serum NGF levels in women with POP and OAB, **Maetzold *et al.*** [13] and **Jankiewicz *et al.*** (excluded from this review) found no significant correlation between urinary biomarkers and OAB symptoms in the POP population.

Table 3 presents the risk of bias assessment for each included study, utilizing the most appropriate tool based on study design. For cohort studies (both prospective and retrospective), the Newcastle-Ottawa Scale (NOS) was employed, a widely used tool that evaluates selection (representativeness, ascertaiNRent of exposure), comparability (control for confounding), and outcome (assessment, follow-up adequacy) with a maximum score of 9 stars. For case-control studies, the NOS was also applied, assessing selection (case definition, representativeness), comparability, and exposure ascertaiNRent. Cross-sectional studies were evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies, which assesses sample frame, study subjects, exposure and outcome measurement, and statistical analysis. The descriptive cross-sectional study was assessed using the JBI checklist for prevalence studies, which evaluates sample frame, sampling method, sample size, study subjects, data analysis, response rate, and outcome measurement. Overall, the majority of studies demonstrated moderate to low risk of bias.

Table 1: Demographic and Study Characteristics of Included Studies

Study (First Author, Year) [Reference]	Location	Study Design	Sample Size (N)	Sample Type / Population	Age (years, mean ± SD or range)	BMI (kg/m², mean ± SD)	Menopausal Status	Parity (median or mean ± SD)	POP-Q Stage (Most Advanced)
Karjalainen PK, 2022 [12]	Finland	Population-based cohort	2,933	Women undergoing POP surgery	NR	NR	NR	NR	NR (Anterior/Apical vs. Posterior groups)
Maetzold EC, 2023 [13]	USA	Prospective cohort	77	Women with anterior/apical POP beyond hymen undergoing surgery	NR	NR	NR	NR	Anterior and/or apical ≥ stage II
Abrams M, 2025 [14]	USA	Prospective cohort	117	Women with anterior/apical prolapse at/beyond hymen + OAB, undergoing apical repair	NR	NR	NR	NR	Anterior/apical ≥ stage II
Padoa A, 2023 [15]	Israel	Retrospective cohort	173	Women with POP stage 3-4 and OAB undergoing POP repair	NR	27.0 (persistent) vs. 25.7 (resolved)	NR	NR	Stage III-IV
Hendrickson WK, 2025 [16]	USA	Prospective cohort (secondary analysis)	579	Primiparous women with singleton term vaginal delivery	29.0 (mean)	NR	NR	NR	NR (POP defined as descent at or beyond hymen)
Shatkin-Margolis A, 2026 [17]	USA	Retrospective cohort	58,841	Fee-for-service Medicare beneficiaries undergoing POP surgery	NR (Older women)	NR	NR	NR	NR
Aimjirakul K, 2023 [18]	Thailand	Retrospective cohort	754	Women with POP attending urogynecology clinic	NR	NR	NR	NR	NR
Wu LY, 2021 [19]	Taiwan	Prospective cohort	100	Postmenopausal women with symptomatic POP undergoing	NR	NR	Postmenopausal (all)	NR	NR

Study (First Author, Year) [Reference]	Location	Study Design	Sample Size (N)	Sample Type / Population	Age (years, mean ± SD or range)	BMI (kg/m², mean ± SD)	Menopausal Status	Parity (median or mean ± SD)	POP-Q Stage (Most Advanced)
				reconstruction surgery					
Saraluck A, 2026 [20]	Thailand	Retrospective case-control	441 (151 VD, 139 OAB, 151 controls)	Women with POP and LUTS attending urogynecology clinic	NR	NR (Overweight described)	Postmenopausal (majority)	Multiparous (majority)	NR
Orozco-Márquez CB, 2021 [21]	Mexico	Descriptive cross-sectional	215	Women with OAB and POP undergoing corrective surgery	NR	NR	NR	NR	NR
Otsubo A, 2021 [22]	Japan	Prospective cohort	41	Women with POP-related OAB undergoing TVM surgery	NR	NR	NR	NR	NR
Frigerio M, 2023 [23]	Italy	Retrospective cohort	533	Women undergoing POP repair	NR	NR	NR	NR	NR
Yildiz Ş, 2021 [24]	Turkey	Case-control	90 (30 per group)	Women with high-grade uterine prolapse and OAB	NR	NR	NR	NR	High-grade uterine prolapse
Yaranun S, 2023 [25]	Thailand	Prospective cohort	27	Women with symptomatic POP and OAB treated with pessary	NR	NR	NR	NR	NR
Abrar S, 2021 [26]	Pakistan	Retrospective cross-sectional	NR	Women with POP and OAB undergoing surgery	NR	NR	NR	NR	All stages

NR: Not reported.

Table 2: Study Objectives, Outcomes, and Key Findings

Study (First Author, Year) [Ref]	OAB Assessment Tool(s)	Primary Outcome(s)	Key Finding(s) Related to POP-OAB Association	Follow-up Duration	Secondary Outcomes / Notes
Karjalainen PK, 2022 [12]	PFDI-20 (bothersome frequency & UUI)	Association between POP compartment and OAB symptom severity/improvement	OAB symptoms more strongly related to anterior/apical than posterior POP. Anterior/apical surgery resulted in greater symptom improvement (82% frequency, 75% UUI resolved).	6 and 24 months	De novo symptoms occurred in 1-3%.
Maetzold EC, 2023 [13]	OAB-q SF, UDI-6	Correlation between urinary biomarkers and postoperative OAB symptoms	OAB-q SF and UDI-6 scores significantly improved post-surgery. No significant correlation was found between preoperative biomarkers and postoperative OAB symptoms.	3 months	Biomarkers for inflammation, neuroinflammation, and tissue remodeling were measured.
Abrams M, 2025 [14]	UDI-6, IIQ-7	≥11-point reduction in UDI-6 at 6 months (responder vs. non-responder)	79.5% of patients reported improved OAB symptoms. Higher preoperative UDI-6 score increased likelihood of improvement (aOR 1.14), while detrusor overactivity (DO) decreased it (aOR 0.10).	2, 6, 12, 24 weeks	Presence of DO was lower in responders (29.0% vs. 54.2%).
Padoa A, 2023 [15]	PFDI-20 (urgency item)	Identification of preoperative predictors for persistent postoperative urgency	Persistent urgency in 44%. Predictors: BMI >25 (OR 1.8), preoperative UUI (OR 3.8), and DO (OR 12.2).	12 months	Urodynamic studies were performed preoperatively.
Hendrickson WK, 2025 [16]	Epidemiology of Prolapse and Incontinence Questionnaire	Association of OAB with genital hiatus (GH) and POP at 1-year postpartum	Enlarged GH (aRR 1.5) and anatomic POP (aRR 1.8) were associated with OAB. Effects were greater in women ≥30 years (aRR 2.1 and 2.2, respectively).	1 year postpartum	Secondary analysis of a prospective cohort.
Shatkin-Margolis A, 2026 [17]	Medicare claims data (new OAB diagnosis)	Use of minimally invasive OAB therapy and new OAB diagnosis post-POP surgery	9.2% had a new OAB diagnosis within 2 years of POP surgery. Factors associated with therapy use: apical surgery (aRR 1.6), concomitant SUI surgery (aRR 1.3), preexisting OAB (aRR 4.1), and frailty (aRR 3.4).	2 years	Therapy included onabotulinumtoxinA, PTNS, and sacral neuromodulation.
Aimjirakul K, 2023 [18]	Pelvic Floor Bother Questionnaire	Prevalence and risk factors for OAB in POP; improvement after treatment	Prevalence of OAB symptoms was 70%. Risk factors: lowest point of anterior wall — POP-Q Ba (OR 0.60), longer perineal body (OR 0.78), and previous vaginal delivery (OR 2.10). Improvement in OAB observed in 36.6%.	NR	No significant differences between PFMT, pessary, and surgery groups.

Study (First Author, Year) [Ref]	OAB Assessment Tool(s)	Primary Outcome(s)	Key Finding(s) Related to POP-OAB Association	Follow-up Duration	Secondary Outcomes / Notes
Wu LY, 2021 [19]	OABSS, Urodynamic study	Effect of pelvic reconstruction surgery on OAB and impact of vaginal estrogen	OABSS decreased significantly (6.87 to 3.77) post-surgery. Urinary NGF levels increased till 3 months then decreased.	1, 3, and 6 months	Preoperative vaginal estrogen was prescribed in 28 cases.
Saraluck A, 2026 [20]	Clinical criteria	Association of POP site and severity with voiding difficulty (VD) and OAB	Advanced stage of anterior compartment prolapse was the only factor associated with both VD (OR 4.91) and OAB (OR 2.28).	NR	Retrospective case-control design.
Orozco-Márquez CB, 2021 [21]	OAB-V8	Improvement in OAB symptoms after corrective POP surgery	Partial improvement in 89.3%, complete improvement in 2.3%, worsening in 8.4%. No association with initial prolapse grade or surgery type.	3 months	Cross-sectional study design.
Otsubo A, 2021 [22]	OABSS	Relationship between bladder wall thickness (BWT) and OABSS change post-TVM surgery	TVM surgery improved OABSS in 73.2% (responders). Pre-surgical BWT at the anterior wall and dome was lower in responders and may be a useful predictive marker.	6 months	BWT measured by ultrasonography.
Frigerio M, 2023 [23]	Clinical symptoms	Clinical and urodynamic findings of COUB/DOU; risk factors for postoperative COUB	Rate of COUB significantly decreased after POP repair. Preoperative opening detrusor pressure was the only independent predictor of postoperative COUB symptoms (p=0.034).	NR	COUB = Co-existing Overactive-Underactive Bladder; DOU = Detrusor Overactivity-Underactivity.
Yildiz Ş, 2021 [24]	Clinical criteria	Association between OAB, high-grade uterine prolapse, and serum NGF levels	Serum NGF levels were significantly higher in the POP+OAB group ($p<0.001$). NGF level >120.49 pg/ml identified OAB with 80% sensitivity and 86.7% specificity.	NR	Case-control study design.
Yaranun S, 2023 [25]	OABSS	Change in OABSS after pessary insertion	Total OABSS significantly decreased (6.9 to 4.4). 85.2% of patients had improved scores. No relationship with age, BMI, parity, or POP-Q stage.	3 months	All subcategories (frequency, nocturia, urgency, incontinence) improved.
Abrar S, 2021 [26]	PFDI-20 (items #15 & #16)	Complete resolution or improvement of urinary frequency and UUI after POP surgery	OAB symptoms improved significantly regardless of prolapse severity. BMI and postoperative constipation were associated with persistent OAB.	24 months	Retrospective study from a single center in Karachi.

NR: Not reported.

Table 3: Risk of Bias Assessment of Included Studies

Study (First Author, Year) [Reference]	Study Design	Assessment Tool	Selection	Comparability	Outcome / Exposure	Total Score	Risk of Bias Judgment
Karjalainen PK, 2022 [12]	Prospective cohort	Newcastle-Ottawa Scale	★★★★	★★	★★★	9/9	Low
Maetzold EC, 2023 [13]	Prospective cohort	Newcastle-Ottawa Scale	★★★	★★	★★★	8/9	Low
Abrams M, 2025 [14]	Prospective cohort	Newcastle-Ottawa Scale	★★★★	★★	★★★	9/9	Low
Padoa A, 2023 [15]	Retrospective cohort	Newcastle-Ottawa Scale	★★★	★★	★★	7/9	Moderate
Hendrickson WK, 2025 [16]	Prospective cohort (secondary analysis)	Newcastle-Ottawa Scale	★★★	★★	★★★	8/9	Low
Shatkin-Margolis A, 2026 [17]	Retrospective cohort	Newcastle-Ottawa Scale	★★★	★★	★★	7/9	Moderate
Aimjirakul K, 2023 [18]	Retrospective cohort	Newcastle-Ottawa Scale	★★★	★★	★★	7/9	Moderate
Wu LY, 2021 [19]	Prospective cohort	Newcastle-Ottawa Scale	★★★	★★	★★★	8/9	Low
Saraluck A, 2026 [20]	Case-control	Newcastle-Ottawa Scale	★★★	★★	★★	7/9	Moderate
Orozco-Márquez CB, 2021 [21]	Descriptive cross-sectional	JBI Checklist for Prevalence Studies	N/A	N/A	N/A	5/9	Moderate
Otsubo A, 2021 [22]	Prospective cohort	Newcastle-Ottawa Scale	★★★	★★	★★★	8/9	Low
Frigerio M, 2023 [23]	Retrospective cohort	Newcastle-Ottawa Scale	★★★	★★	★★	7/9	Moderate
Yildiz Ş, 2021 [24]	Case-control	Newcastle-Ottawa Scale	★★★	★	★★	6/9	Moderate
Yaranun S, 2023 [25]	Prospective cohort	Newcastle-Ottawa Scale	★★★	★★	★★★	8/9	Low
Abrar S, 2021 [26]	Retrospective cross-sectional	JBI Checklist for Analytical Cross-Sectional Studies	N/A	N/A	N/A	6/8	Moderate

For the Newcastle-Ottawa Scale, a score of 7–9 indicates low risk of bias, 4–6 indicates moderate risk, and 0–3 indicates high risk. For JBI checklists, scores are interpreted based on the proportion of criteria met: ≥70% = low risk, 50–69% = moderate risk, <50% = high risk.

DISCUSSION

The prevalence of OAB in women with POP was notably high, with **Aimjirakul *et al.*** [18] reporting a prevalence of 70% in their Thai cohort, while a comprehensive systematic review and meta-analysis by **Pierro *et al.*** [27], encompassing 24 studies and 7,739 women, reported an overall OAB resolution rate of 58.0% (95% CI: 55.9–60.1%) following prolapse surgery.

This is consistent with a systematic literature review conducted in April 2020, which concluded that women with pelvic organ prolapse very often have OAB, and that prolapse surgery should be considered when the prolapse is symptomatic [28, 29]. The global prevalence of OAB in the general female population has been estimated at approximately 13–20%, with prevalence increasing with age from 15% in women aged 20–29 years to 21% in women aged >70 years [1]. The marked disparity between these figures and the 70% prevalence reported in POP populations underscores the strength of the association and highlights the clinical importance of screening for OAB in women presenting with POP. Furthermore, a systematic review and meta-analysis by **Hirsch *et al.*** [30], which included eight randomized controlled trials encompassing 807 women, demonstrated that POP repair is associated with clinically meaningful improvement in preoperative OAB-related symptoms, with pooled analysis showing a significant reduction in UDI-6 scores (mean change −17 points, 95% CI −19.90 to −14.54; $p < 0.001$).

The compartment-specific analysis from our review represents one of the most clinically relevant findings, demonstrating that anterior and apical compartment prolapse are significantly more strongly associated with OAB symptoms than posterior compartment prolapse. The FINPOP study by **Karjalainen *et al.*** [12] provided robust population-based evidence from 2,933 POP surgeries, showing that bothersome urinary frequency resolved in 82% of women after anterior/apical surgery compared to only 63% after posterior compartment surgery, while bothersome urgency urinary incontinence resolved in 75% versus 61%, respectively. Women undergoing surgery for the anterior/apical compartment started with worse symptoms and experienced greater improvement than women undergoing posterior compartment surgery. These findings are corroborated by the case-control study of **Saraluck *et al.*** [20], which identified advanced anterior compartment prolapse as the only factor independently associated with OAB (OR 2.28, 95% CI 1.09–4.78), and by the work of **Aimjirakul *et al.*** [18], who found that the lowest point of the anterior vaginal wall (POP-Q point Ba) was a significant risk factor for OAB symptoms (OR 0.60, 95% CI 0.41–0.87, $p = 0.01$).

The compartment-stratified analysis from the meta-analysis by **Pierro *et al.*** [27] further confirms this observation, demonstrating significantly superior OAB resolution rates following anterior and apical compartment repair compared to posterior repair, independent of surgical approach or use of mesh augmentation.

A systematic review by **Cameron** [5] confirmed that POP appears to be causative of OAB symptoms in some women, as correction of the POP resolves bladder symptoms in many cases. The pathophysiological basis for this compartment-specific relationship likely relates to the anatomical proximity of the anterior vaginal wall to the bladder base and urethra, where prolapse can cause mechanical bladder outlet obstruction through urethral kinking.

As articulated by **Patil and Duckett** [31], the most commonly accepted pathophysiology when prolapse is involved is that of increased bladder outlet obstruction or resistance, and this is supported when the correction of POP improves voiding function, which is associated with a reduction in OAB. A recent review on POP syndrome and lower urinary tract symptoms also confirmed that bladder outlet obstruction increases variation in bladder structure and function, which can lead to OAB, although there appears to be no direct connection between POP stage and lower urinary tract symptoms [32].

The rate of OAB symptom improvement following POP treatment observed in our included studies demonstrates considerable consistency across different treatment modalities and populations. **Abrams *et al.*** [14] reported that 79.5% of patients experienced clinically significant improvement in OAB symptoms at 6 months following anterior/apical repair, with higher preoperative UDI-6 scores increasing the likelihood of improvement (adjusted OR 1.14 per point), while the presence of detrusor overactivity was associated with a decreased likelihood of improvement (adjusted OR 0.10). **Orozco-Márquez *et al.*** [21] found that 89.3% of patients experienced partial improvement and 2.3% experienced complete improvement following corrective POP surgery, while **Otsubo *et al.*** [22] reported that 73.2% of patients were responders to transvaginal mesh surgery with significant improvement in OABSS. OAB-specific instruments demonstrated direct symptom improvement, with pooled weighted mean reductions of −3.17 points on the ICIQ-OAB and −12.9 points on the OAB-V8 across randomized controlled trials. Notably, the beneficial effect extends beyond surgical interventions to conservative management.

Yaranun *et al.* [25] demonstrated that pessary insertion led to significant improvement in OABSS in 85.2% of patients, with all subcategories including

frequency, nocturia, urgency, and incontinence showing improvement. This is consistent with the systematic review by **Cameron** [5], which concluded that women with both lower urinary tract symptoms and symptomatic POP should probably have their POP targeted, as its reduction either via surgery or pessary can correct the lower urinary tract symptoms. However, not all women experience resolution of their OAB symptoms, and some women develop them de novo after POP repair. The meta-analysis by **Hirsch *et al.*** [30] found that among women with preoperative OAB, persistent symptoms were reported in 20.6% of cases across surgical approaches, while de novo OAB occurred in approximately 5% of the 807 participants, with significantly increased odds of postoperative de novo OAB (OR 15.46, 95% CI 5.08–47.02). The FINPOP study [12] reported bothersome de novo symptoms in only 1–3% of cases. Subgroup analysis showed higher odds of de novo OAB after sacrocolpopexy/sacrohysteropexy compared with vaginal procedures (OR 5.10, 95% CI 1.56–16.71; p = 0.01).

The identification of preoperative predictors for persistent OAB symptoms provides valuable clinical guidance for patient counseling and preoperative risk stratification.

Padoa *et al.* [15] demonstrated that preoperative detrusor overactivity (OR 12.2), urgency urinary incontinence (OR 3.8), and BMI >25 kg/m² (OR 1.8) were significant independent predictors of persistent urgency at 12 months following POP surgery. **Abrams *et al.*** [14] similarly found that the presence of detrusor overactivity on preoperative urodynamics was associated with a decreased likelihood of OAB symptom improvement (adjusted OR 0.10).

The study by **Frigerio *et al.*** [23] identified preoperative opening detrusor pressure as the only independent predictor of postoperative coexisting overactive–underactive bladder symptoms (p = 0.034). **Abrar *et al.*** [26] found that BMI and postoperative constipation were the only statistically significant variables associated with persistent OAB symptoms postoperatively.

A review by **de Boer *et al.*** [33] on predictors for OAB symptoms after POP surgery concluded that while improvement can generally be expected, the results of various studies are inconclusive, and it remains essentially impossible to reliably predict the presence of OAB after POP surgery. The role of preoperative detrusor overactivity remains unclear, with some studies finding improvement and others finding persistence of OAB. The detrusor opening pressure and maximum flow rate appear to play a role, and the absence of bothersome OAB preoperatively was a further predictor for absence of postoperative symptoms. More recent studies have identified additional predictive factors, including the preoperative International Prostate Symptom Score storage subscore as a useful predictor for the persistence of preoperative OAB symptoms after surgery [34]. **Wu *et al.*** [19] observed that pelvic reconstruction surgery significantly improved OABSS (from 6.87 to 3.77, p < 0.001), with urinary NGF levels showing an increasing trend until 3 months postoperatively before returning to baseline, suggesting a surgery-induced inflammatory effect lasting approximately 6 months.

Otsubo *et al.* [22] found that presurgical bladder wall thickness at the anterior wall and dome, but not the trigone, was significantly lower in OABSS responders and may be a useful predictive marker for improvement in OAB symptoms after TVM surgery.

Maetzold *et al.* [13] found no significant correlation between preoperative urinary biomarkers (inflammation, neuroinflammation, and tissue remodeling) and postoperative OAB symptoms, while **Yildiz *et al.*** [24] demonstrated that serum NGF levels with a cutoff point of 120.49 pg/ml identified women with significant OAB symptoms with 80% sensitivity and 86.7% specificity, suggesting that NGF-related pathways may play an active role in the pathophysiology of OAB in patients with high-grade uterine prolapse.

LIMITATIONS

Several limitations of the systematic review include heterogeneity in study designs, varying assessment tools for OAB symptoms, incomplete demographic data, and inconsistent follow-up durations. Most studies were from high-income countries, affecting generalizability, while publication bias and potential recall bias from retrospective studies undermine findings. The lack of standardized urodynamic evaluations complicates objective assessments, and referenced meta-analyses may not align with this review's conclusions. Lastly, excluding non-English studies may have introduced language bias.

CONCLUSION

There is a significant association between pelvic organ prolapse (POP) and overactive bladder (OAB) symptoms, particularly noting stronger relationships with anterior and apical compartment prolapse. Treatment for POP, whether surgical or conservative, often leads to substantial improvement in OAB symptoms, with about 58% of patients experiencing resolution post-surgery. However, around 20% of patients may have persistent OAB symptoms, and 5% could develop new symptoms postoperatively. Identifying predictors for persistent OAB—such as detrusor overactivity and elevated BMI—can guide patient care. It is recommended that clinicians assess OAB symptoms in women with POP and consider POP treatment as essential for managing OAB. Future research should aim for well-controlled, standardized

studies to explore the underlying mechanisms and effectiveness of treatments across varied populations, as well as improve predictive models for risk stratification and personalized care in affected women.

DECLARTIONS

Ethics Approval and Consent to Participate

As this study is a systematic review of previously published literature, it did not involve the collection of primary data from human or animal subjects. Therefore, formal ethical approval and individual participant consent were not required. All included studies were conducted in accordance with the ethical standards of their respective institutional and/or national research committees.

Consent for Publication

Not applicable, as this manuscript does not contain any individual person's data in any form (e.g., individual details, images, or videos).

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Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

All authors cooperated in drafting, wrtiting, synthesis of the study and they reviewed and approved the final manuscript.

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REFERENCES

1. Zhang L, Cai N, Mo L, Tian X, Liu H, Yu B. Global prevalence of overactive bladder: a systematic review and meta-analysis. International urogynecology journal. 2025 Aug;36(8):1547-66.
2. Stewart WF, Van Rooyen J, Cundiff G, Abrams P, Herzog A, Corey R, Hunt T, Wein A. Prevalence and burden of overactive bladder in the United States. World journal of urology. 2003 May;20(6):327-36.
3. Haylen BT, Maher CF, Barber MD, Camargo S, Dandolu V, Digesu A, Goldman HB, Huser M, Milani AL, Moran PA, Schaer GN. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic organ prolapse (POP). International urogynecology journal. 2016 Feb;27(2):165-94.
4. Hadizadeh-Talasaz Z, Khadivzadeh T, Mohajeri T, Sadeghi M. Worldwide prevalence of pelvic organ prolapse: a systematic review and meta-analysis. Iranian Journal of Public Health. 2024 Mar;53(3):524.
5. Cameron AP. Systematic review of lower urinary tract symptoms occurring with pelvic organ prolapse. Arab Journal of Urology. 2019 Jan 2;17(1):23-9.
6. Diez-Itza I, Martin-Martinez A, Uranga S, Avila M, Lekuona A, Garcia-Hernandez J. Can We Predict Overactive Bladder Resolution After Prolapse Surgery?. Inneurourology And Urodynamics, 2020; 39: S86-S87. 111 RIVER ST, HOBOKEN 07030-5774, NJ USA: WILEY.
7. De Boer TA, Salvatore S, Cardozo L, Chapple C, Kelleher C, Van Kerrebroeck P, Kirby MG, Koelbl H, Espuna-Pons M, Milsom I, Tubaro A. Pelvic organ prolapse and overactive bladder. Neurourology and Urodynamics: Official Journal of the International Continence Society. 2010 Jan;29(1):30-9.
8. Zumrutbas AE. Understanding pelvic organ prolapse: a comprehensive review of etiology, epidemiology, comorbidities, and evaluation. Société Internationale d'Urologie Journal. 2025 Feb 12;6(1):6.
9. Pierro M, Perossini S, Vacca L, Caramazza D, Lombisani A, Foresta A, Marturano M, Ercoli A, Campagna G. 77–Surgical Treatment of Pelvic Organ Prolapse and Overactive Bladder: A Systematic Review and Meta-Analysis. Continence. 2026 Jun 1;17:102414.
10. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, ***et al.*** The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi: 10.1136/bmj.n71.
11. Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, ***et al.*** Cochrane Handbook for Systematic Reviews of Interventions. Version 6.4. Cochrane; 2023. Available from: www.training.cochrane.org/handbook.
12. Karjalainen PK, Tolppanen AM, Mattsson NK, Wihersaari OA, Jalkanen JT, Nieminen K. Pelvic organ prolapse surgery and overactive bladder symptoms—a population-based cohort (FINPOP). International Urogynecology Journal. 2022 Jan;33(1):95-105.
13. Maetzold EC, Santillan DA, Kenne KA, Bradley CS, Ten Eyck P, Wendt L, Funk M, Kowalski JT. Urinary biomarkers and overactive bladder symptoms before and after prolapse surgery. Urogynecology. 2023 Feb 1;29(2):266-72.
14. Abrams M, Sears S, Wherley S, Rhodes S, Mangel J, Sheyn D. Resolution of overactive bladder symptoms after anterior and apical prolapse repair. Urogynecology. 2025 Feb 1;31(2):147-53.
15. Padoa A, Levy E, Fligelman T, Tomashev-Dinkovich R, Tsviban A, Serati M. Predictors of persistent overactive bladder following surgery for advanced pelvic organ prolapse. International Urogynecology Journal. 2023 Mar;34(3):759-67.
16. Hendrickson WK, Allshouse A, Nygaard IE, Swenson CW. Association between enlarged genital hiatus and prolapse with overactive bladder 1 year after vaginal delivery. American Journal of Obstetrics and Gynecology. 2025 Apr 16.
17. Shatkin-Margolis A, Wang L, Nik-Ahd F, Dreyfuss LD, Covinsky K, Boscardin WJ, Suskind AM. Minimally Invasive Overactive Bladder Therapy After Prolapse Surgery. Urogynecology. 2026 Jan 1;32(1):48-57.

18. Aimjirakul K, Ng JJ, Saraluck A, Wattanayingcharoenchai R, Mangmeesri P, Manonai J. A retrospective cohort study on the prevalence, risk factors, and improvement of overactive bladder symptoms in women with pelvic organ prolapse. International Journal of Women's Health. 2023 Dec 31:1039-46.
19. Wu LY, Huang KH, Yang TH, Huang HS, Wang TS, Lan KC, Chuang FC. The surgical effect on overactive bladder symptoms in women with pelvic organ prolapse. Scientific Reports. 2021 Oct 12;11(1):20193.
20. Saraluck A, Chinthakanan O, Aimjirakul K, Wattanayingcharoenchai R, Manonai J. Effects of compartment and severity of pelvic organ prolapse on voiding difficulty and overactive bladder: A case-control study with multiple outcomes. PLoS One. 2026 May 21;21(5):e0348221.
21. Orozco-Márquez CB, Murguía-Flores EA, Zaragoza-Torres RM, Rodríguez-Salazar DC. Improvement of overactive bladder after corrective surgery for pelvic organ prolapse. Revista Mexicana de Urología. 2021 Aug 18;81(3):1-2.
22. Otsubo A, Matsuo T, Miyata Y, Mukae Y, Mitsunari K, Ohba K, Sakai H. Presurgical bladder wall thickness is a useful marker to predict the postsurgical improvement of symptoms in patients with pelvic organ prolapse-related overactive bladder. LUTS: Lower Urinary Tract Symptoms. 2021 Jul;13(3):347-55.
23. Frigerio M, Barba M, Cola A, Spelzini F, Milani R, Manodoro S. Coexisting overactive–underactive bladder and detrusor overactivity–underactivity in pelvic organ prolapse. International Journal of Gynecology & Obstetrics. 2023 Jan;160(1):256-62.
24. Yildiz Ş, Cengiz H, Kural A, Kaya C, Alay İ, Ekin M. Association between overactive bladder and serum nerve growth factor concentrations in women with high-grade uterine prolapse. International Urogynecology Journal. 2021 Feb;32(2):345-51.
25. Yaranun S, Chiengthong K, Ruanphoo P, Bunyavejchevin S. Overactive bladder symptom score changes after pessary insertion in women with pelvic organ prolapse and overactive bladder. Thai Journal of Obstetrics and Gynaecology. 2023 May 1:201-7.
26. Abrar S, Rizvi RM, Zahid N. The association of symptoms of overactive bladder with pelvic organ prolapse and its improvement after pelvic reconstructive surgery. Pakistan Journal of Medical Sciences. 2021 May;37(3):897.
27. Pierro M, Perossini S, Vacca L, Caramazza D, Lombisani A, Foresta A, Marturano M, Ercoli A, Campagna G. 77–Surgical Treatment of Pelvic Organ Prolapse and Overactive Bladder: A Systematic Review and Meta-Analysis. Continence. 2026 Jun 1;17:102414.
28. Game X, Phe V. Non-neurological overactive bladder and pelvic-perineal pathology in women. Progres en urologie: journal de l'Association francaise d'urologie et de la Societe francaise d'urologie. 2020 Nov;30(14):887-94.
29. Game X, Phe V. First-line treatment for non-neurogenic overactive bladder. Progres en Urologie: Journal de L'association Francaise D'urologie et de la Societe Francaise D'urologie. 2020 Nov 1;30(14):904-19.
30. Hirsch A, Rabinovich M, Hirsh Raccah B, O'Reilly B, Weintraub A, Rotem R. Pelvic organ prolapse repair and overactive bladder symptoms: a systematic review and meta-analysis of randomized controlled trials [abstract]. In: International Continence Society (ICS) Annual Meeting; 2026; Abstract No. 347. Available from: https://www.ics.org/2026/abstract/347
31. Patil A, Duckett JR. Effect of prolapse repair on voiding and bladder overactivity. Current Opinion in Obstetrics and Gynecology. 2010 Oct 1;22(5):399-403.
32. Munno GM, La Verde M, Lettieri D, Nicoletti R, Nunziata M, Fasulo DD, Vastarella MG, Pennacchio M, Scalzone G, Pieretti G, Fortunato N. Pelvic organ prolapse syndrome and lower urinary tract symptom update: what's new?. InHealthcare 2023 May 22 (Vol. 11, No. 10, p. 1513). MDPI.
33. de Boer TA, Vierhout ME. Predictors for overactive bladder symptoms after pelvic organ prolapse surgery. Current Opinion in Obstetrics and Gynecology. 2011 Oct 1;23(5):366-70.
34. Otsuka A, Watanabe K, Matsushita Y, Watanabe H, Tamura K, Motoyama D, Ito T, Sugiyama T, Miyake H. Predictive factors for persistence of preoperative overactive bladder symptoms after transvaginal mesh surgery in women with pelvic organ prolapse. LUTS: Lower Urinary Tract Symptoms. 2020 May;12(2):167-72.