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Prevalence of urinary incontinence and its sports-related associated factors among female competitive athletes: A systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION**Support** - This research received no external funding.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY2026100072**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 October 2026 and was last updated on 15 October 2026.**INTRODUCTION**

Review question / Objective This study aims to systematically assess the pooled prevalence of urinary incontinence (UI) among female competitive athletes, and quantitatively explore the effects of sports-related factors on the prevalence of UI.

Rationale Urinary incontinence (UI) is a prevalent pelvic floor disorder that impairs physical health, athletic performance and quality of life in female athletes. Advanced age, parity and obesity are established UI risk factors in general women. However, accumulating evidence indicates that young and nulliparous female athletes also present a high UI prevalence, suggesting that sport-specific mechanical loading serves as an independent risk factor for pelvic floor damage.

Previous meta-analyses have consistently reported a high UI burden in female athletes, but the pooled prevalence estimates vary considerably from

25.9% to 46%. Such large discrepancies are mainly attributed to inconsistent inclusion populations, different competitive levels, uneven parity distributions and heterogeneous assessment tools across systematic reviews. Traditional sport classification relying merely on impact type cannot fully reflect actual pelvic floor stress. The real pelvic floor burden is dynamically regulated by training volume, training intensity and recovery patterns. Notably, different sport categories may share identical pathogenic mechanisms; both strength sports and high-impact sports can sharply increase intra-abdominal pressure via the Valsalva maneuver during explosive movements, leading to similar pelvic floor loading risks.

At present, it remains unclear whether core sport-related factors, including impact classification, competitive level, training volume and training years, can explain the substantial heterogeneity of UI prevalence across studies. Therefore, this systematic review and meta-analysis was performed to pool existing evidence to estimate

the overall UI prevalence in competitive female athletes and explore sport-related heterogeneous sources, aiming to provide evidence for targeted pelvic floor health prevention for female athletes.

Condition being studied This study focused on ****competitive female athletes****. Eligible participants were female athletes who regularly participated in formal training and official competitions at any competitive level. No restrictions were imposed on age, sport discipline, training experience, parity status or body mass index. Studies focusing on recreational athletes, non-competitive exercisers or mixed populations without independent athletic data were excluded.

METHODS

Participant or population Competitive female athletes (female athletes undertaking regular formal training and official competitions of any competitive level). Studies including only recreational exercisers or mixed samples without separate data for competitive athletes will be excluded. No restrictions on age, sport type, parity or BMI.

Intervention No specific intervention was involved. This study was a prevalence-based systematic review focusing on observational data regarding urinary incontinence status in competitive female athletes.

Comparator No specific comparator was set. All included observational studies reported the prevalence of urinary incontinence among competitive female athletes without controlled comparison groups.

Study designs to be included Observational studies, including cross-sectional studies, cohort studies, and baseline data from randomized controlled trials, which reported the prevalence of urinary incontinence in competitive female athletes. Reviews, case reports, letters, conference abstracts and studies without available raw prevalence data were excluded.

Eligibility criteria Inclusion criteria

1. Study population consisted of competitive female athletes with regular formal training and official competition experience.
2. Original observational studies, including cross-sectional studies, cohort studies, and baseline data of randomized controlled trials.
3. Studies clearly reporting the prevalence or original countable data of urinary incontinence in female athletes.

4. Published in English with full text available.

Exclusion criteria

1. Studies focusing on recreational exercisers or non-competitive female participants.
2. Reviews, letters, conference abstracts, case reports, and repeated publications.
3. Studies lacking usable prevalence data or unclear diagnostic criteria for urinary incontinence.
4. Studies mixing athletic and non-athletic populations without independent extractable data for competitive female athletes.

Information sources Electronic databases including PubMed, Embase and Cochrane Library will be searched from inception to December 23, 2025. Reference lists of included studies and relevant systematic reviews will be manually screened, and forward citation searching will be performed to identify additional eligible studies. No restriction on language was applied in the searching stage, but only English full-text articles will be finally included.

Main outcome(s) The primary outcome is the pooled prevalence of urinary incontinence (UI) among competitive female athletes.

Quality assessment / Risk of bias analysis The methodological quality and risk of bias of included cross-sectional and cohort studies will be assessed using the Newcastle-Ottawa Scale (NOS). The risk of bias of RCT baseline data will be evaluated using the Cochrane Risk of Bias 2.0 tool. Two independent reviewers will conduct the assessment, and disagreements will be resolved by discussion or consultation with a third reviewer.

Strategy of data synthesis The pooled prevalence of urinary incontinence and its 95% confidence interval (CI) will be calculated using single-proportion meta-analysis. A random-effects model will be applied when substantial heterogeneity is observed ($I^2 \geq 50\%$ or $P < 0.10$); otherwise, a fixed-effects model will be used. Heterogeneity across studies will be assessed using the Cochran's Q test and the I^2 statistic. Subgroup analyses and meta-regression will be performed to explore potential sources of heterogeneity, including impact classification, competitive level, training volume, and training years. Sensitivity analysis will be conducted by omitting one study at a time to evaluate the robustness of the pooled results. Publication bias will be evaluated using funnel plots and Egger's regression test. All statistical analyses will be performed using R software.

Subgroup analysis Subgroup analyses will be conducted according to impact classification,

competitive level, training volume and training years. The pooled prevalence of urinary incontinence and 95%CI will be calculated for each subgroup to explore whether these factors can explain the between-study heterogeneity.

Sensitivity analysis Leave-one-out sensitivity analysis will be performed by sequentially removing one study at a time and recalculating the pooled prevalence. This method is used to evaluate whether the overall pooled result is driven by any single study and test the robustness of the meta-analysis findings.

Country(ies) involved China.

Keywords female athlete, competitive athlete, urinary incontinence, pelvic floor dysfunction, prevalence.

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