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Prevalence of urinary incontinence in patients with chronic cough: a systematic review

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Abstract

Chronic cough-related diseases increase the risk of urinary incontinence (UI) due to repeated intra-abdominal pressure affecting the pelvic floor. Existing studies focus on specific diseases rather than UI as a broader consequence. To determine the prevalence of UI in patients with chronic cough-related diseases and compare it with the prevalence in healthy populations. A systematic review was conducted using Medline, Embase, Cochrane, OVID, Scopus, ProQuest, PEDro, and EBSCO. Two independent reviewers screened studies using predefined criteria in a Microsoft Excel spreadsheet. Only prevalence studies were included. Data were extracted, synthesized, and assessed using the GRADE approach for evidence quality and the STROBE checklist for reporting quality. Prevalence estimates varied widely based on demographic characteristics. UI prevalence ranged from 2.2% to 45% in pediatric patients, 30.4% to 74% in adult women, and 2.4% to 39% in adult men. The quality of evidence was low, while reporting quality was acceptable. UI is a common complication in patients with chronic cough, with a higher prevalence than in healthy populations. Due to the stigma surrounding urogenital disorders, clinicians should actively inquire about UI during patient history-taking and refer affected individuals for appropriate treatment.

Key words: chronic cough, urinary incontinence, prevalence, pelvic floor dysfunction.

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Introduction

Chronic respiratory diseases affect approximately 7.4% of the global population, with an increasing prevalence over the past three decades due to population growth and aging [1]. These diseases are associated with symptoms such as dyspnea, fatigue, chest tightness, and chronic cough. Chronic cough is present in various conditions, including intrathoracic causes [*e.g*., asthma, lung cancer, tuberculosis, cystic fibrosis (CF), chronic obstructive pulmonary disease (COPD)] and extrathoracic causes (*e.g*., chronic allergic rhinitis, postnasal drip, gastroesophageal reflux). Its prevalence varies widely, ranging from 3% to 24% in adults [2].

Cough is a physiological reflex aimed at clearing the airways. It involves four phases: stimulus (i), inspiration (ii), explosive expiratory effort with a closed glottis (iii), and forced expiration after glottis opening (iv) [3]. This effort significantly increases intra-abdominal pressure from 20 mmHg at rest to an average of 107.6 mmHg [4]. Cough is controlled by the vagus nerve, with sensory input reaching the central nervous system and integrating with the respiratory pattern generator in the brainstem. The reticular formation, modulated by cortical input, allows voluntary cough control and coordinates motor responses, including activation of respiratory muscles and pelvic floor sphincters [5].

The pelvic floor is composed of three muscle layers supporting pelvic organs, innervated by the pudendal nerve (S3-S4). Its muscular structure, particularly the circular arrangement around the urethral and anal sphincters, is essential for continence. Factors such as weight fluctuations, hormonal changes (*e.g*., menopause), and pregnancy can weaken the pelvic floor, particularly in women, increasing the risk of urinary incontinence (UI).

Stress UI (SUI) is defined as the involuntary loss of urine during activities that increase intra-abdominal pressure, such as coughing or sneezing. It results from urethral or bladder neck hypermobility due to weakened pelvic support structures. Chronic cough contributes to pelvic floor overload, further impairing continence. UI negatively impacts quality of life, leading to emotional distress, social isolation, and reduced health perception [6]. Emerging evidence suggests that pelvic floor muscle contraction occurs as a preprogrammed response to increased abdominal pressure, rather than a reflexive reaction to cough [7].

Recent studies indicate that pelvic floor physiotherapy improves continence in patients with chronic cough-induced UI, although lifelong exercise may be necessary [8]. Additionally, functional electrical stimulation of the pelvic floor enhances diaphragmatic excursion and may optimize respiratory function, correlating pelvic floor strength with improved expiratory flow [9].

A preliminary literature review conducted in January 2025 found no prior systematic reviews specifically addressing UI prevalence in patients with chronic cough. Existing studies either focus on individual respiratory diseases or examine cough as a non-isolated risk factor for UI. This review aims to determine the prevalence of UI in patients with chronic cough-related diseases and compare it with general population data, highlighting UI as a secondary symptom requiring clinical attention.

Methods

This systematic review was prospectively registered on PROSPERO (17 February 2025, CRD42025630625) and is presented according to the PRISMA guidelines.

This systematic review included only prevalence studies on UI. The target population comprised patients diagnosed with conditions causing chronic cough, including CF, COPD, asthma, bronchiectasis, interstitial lung diseases, lower airway tumors, allergic rhinitis, gastroesophageal reflux disease (GERD), postnasal drip, left heart failure, and tuberculosis. No restrictions were placed on publication date, patient age, or sex.

A comprehensive literature search was conducted on April 16, 2025, using advanced search tools across 6 general databases (Pubmed – Medline; Embase, Cochrane Library, Ovid, Scopus, Proquest – Publicly Available Content Database, SciTech Premium Collection, Science Database, Coronavirus Research Database, Psychology Database) and two specialized search engines (PEDro and EBSCO – CINAHL Ultimate, Education Source Ultimate, APA PsycInfo, Psychology and Behavioral Sciences Collection, Child Development & Adolescent Studies, Business Source Complete, Library & Information Science Source, Sociology Source Ultimate). To ensure comprehensive coverage, reference lists from the included studies were manually reviewed to identify additional eligible articles not retrieved through the search strategy.

The PICO model was adapted to suit the prevalence study framework, opting for the CoCoPop model [10] (condition: UI; context: chronic cough-related diseases; population: patients diagnosed with CF, GERD, COPD, asthma, chronic allergic rhinitis, bronchiectasis, sarcoidosis, idiopathic pulmonary fibrosis, laryngopharyngeal reflux, or chronic cough).

Key search terms were identified, and a comprehensive search string was developed; the search string was then adapted for each database, as detailed in *Supplementary Table 1*.

Following the search phase, articles were compiled, and duplicates were removed using Microsoft Excel. Two independent reviewers screened the articles in a blinded manner, initially by title and abstract, followed by full-text assessment. Studies were included if they investigated the prevalence of UI in populations diagnosed with conditions causing chronic cough. Exclusion criteria comprised non-English articles to prevent translation inconsistencies, studies unavailable in full text (preventing critical evaluation) and publications in non-peer-reviewed journals. A final comparison between reviewers resolved any selection discrepancies.

Two independent reviewers conducted data extraction by systematically analyzing full texts. Relevant information regarding UI prevalence among patients with chronic cough-related conditions was collected. Data were entered into an Excel spreadsheet, including numerical values and study definitions of UI. Extracted study characteristics included: author, publication year, study design, observation period, sample size, sex distribution (categorized by condition), inclusion and exclusion criteria, mean age and body mass index (BMI), forced expiratory volume in 1 second as a percentage of the predicted value (FEV1%), data collection methodology and definition and prevalence of UI.

Risk of bias was evaluated using the GRADE framework. Rather than assigning a quantitative score, GRADE provides an overall assessment of evidence quality, integrating qualitative bias evaluation. Observational studies start at a default "low" evidence level unless notable strengths or significant limitations alter the assessment. Since this review exclusively includes prevalence studies, follow-up completeness was not considered a bias criterion. The overall confidence in the evidence body was determined based on these factors. However, GRADE ratings were not used to exclude studies from the review.

Extracted data were synthesized in tabular format, ensuring clarity in reporting sample size, mean age, BMI, FEV1%, and UI prevalence. The tabular presentation enabled direct comparisons and identification of missing data across included studies.

To ensure accurate study reporting, the STROBE checklist was applied. While not a formal assessment tool, STROBE guided the identification of reporting gaps within included studies.

Results

The study selection process followed the criteria established in the initial protocol. A systematic database search identified 1585 articles, with 3 additional studies included after reviewing the bibliographies of relevant publications. Following automatic duplicate removal, title and abstract screening, and selection based on predefined criteria, 23 articles were included in this review. The selection process is illustrated in the PRISMA flow diagram (Figure 1), following the 2020 PRISMA guidelines [11].

The 23 included studies were observational (cross-sectional or prospective), investigating UI prevalence and published between 2000 and 2024 [7,12-33]. The review encompassed different conditions, leading to variations in patient demographics and disease progression.

The 23 studies included in this review exhibited significant variability in terms of population characteristics. Regarding sex distribution, 11 studies focused exclusively on female participants, 9 investigated mixed-gender populations, and 3 examined only male subjects. Sample size also varied considerably: while 20 studies had relatively small sample sizes, typically fewer than 250 participants and conducted in single-center settings, 3 studies were nationwide and included larger cohorts. The available studies predominantly focused on CF and COPD, with only 2 studies addressing idiopathic chronic cough, 2 studies including asthma, and 1 study examining a broader category of "other respiratory diseases".

The inclusion criteria were often broad, particularly in studies on CF, where 10 studies included all patients attending a reference center, sometimes with age restrictions but without additional specific selection parameters. For studies on COPD, the primary inclusion criterion was a confirmed diagnosis based on spirometry, following the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines [34]. In contrast, exclusion criteria were more consistently applied across studies, with the most common exclusions involving patients with neurological disorders, the presence of respiratory diseases in control groups, pregnancy, and individuals unable to complete questionnaires due to illiteracy, language barriers, or cognitive impairments.

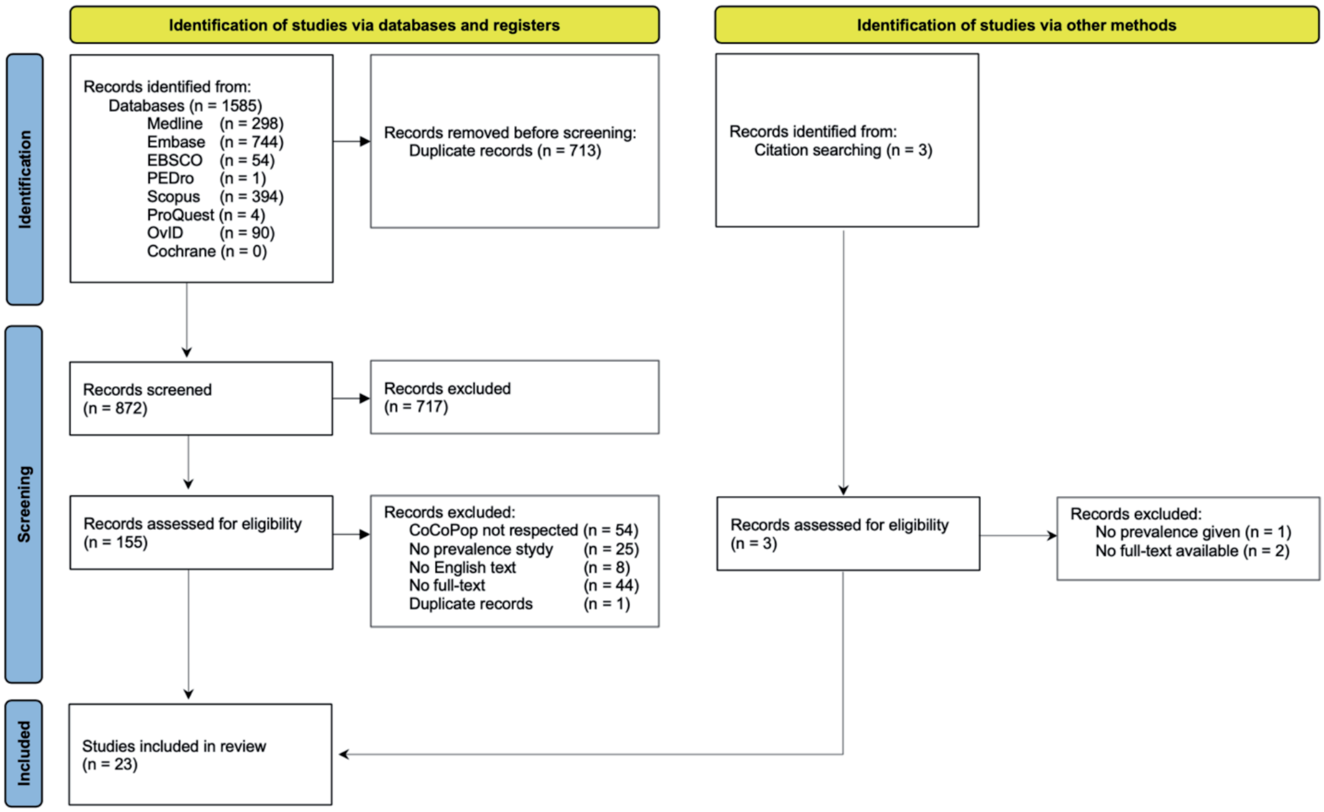

Figure 1. Flow diagram following PRISMA guidelines for systematic reviews.

The age range covered in the studies was broad, spanning from pediatric to elderly populations. 7 studies included control groups composed of either healthy individuals or those with other respiratory conditions and employed age-matching techniques to ensure comparability.

The prevalence of UI was primarily assessed using questionnaires, most commonly the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF) or its variations, which evaluate the frequency and severity of incontinence as well as its impact on quality of life. The mode of questionnaire administration varied among the studies: in 13 cases, patients or their caregivers completed the questionnaires independently, whereas in 7 studies, the data collection was clinician-assisted. The remaining 3 studies did not specify the method of administration.

Several studies investigated potential risk factors for UI in patients with chronic respiratory diseases. With regard to BMI, 3 studies reported that being overweight, with a BMI equal to or greater than 25, doubled the risk of UI in individuals experiencing chronic cough. Conversely, 1 study found an association between low BMI, defined as below 18.5, and a higher prevalence of UI, although this finding was specific to CF patients. Other studies either did not assess BMI or failed to identify a significant correlation.

The severity of respiratory disease was also examined in relation to UI prevalence. Two studies reported an association between lower FEV1% and an increased prevalence of UI. However, the extent of this impact varied depending on the type of respiratory disease and the mean age of the study population.

Due to demographic variability among the included studies, UI prevalence was analyzed according to age, sex, and disease type. Weighted averages were calculated to adjust for sample size, revealing notable trends across different population groups, as presented in Table 1. Among female patients, prevalence rates varied according to age. In pediatric populations, UI was reported in 27% of cases, compared to 7% in control groups. Among adults aged between 18 and 45 years, 61% of CF patients experienced UI, in contrast to 55% in the healthy control group. For women over 45 years of age, the prevalence reached 63.3%, although no comparative data with healthy individuals were available. The reported prevalence of UI among patients with asthma ranged from 16.0% to 33.9%. In one study, participants were classified into CF, other respiratory diseases (a category that may have included asthma), and healthy controls; the prevalence of UI in the "other respiratory diseases" group was 30.0%. Among studies investigating chronic cough, the prevalence of UI ranged from 63.3% to 75.5%.

Data on male populations were limited, but the available studies suggested that UI prevalence was similar to that of healthy control groups. In studies that included mixed-gender populations, the prevalence of UI was consistently higher among individuals with chronic cough-related diseases, such as COPD and CF.

Some studies were excluded from specific prevalence analyses due to methodological concerns. The study by Orr *et al.* was omitted because it lacked age-stratified data [26], while the work by Hrisanfow *et al.* was excluded to prevent duplication [20], as it analyzed the same cohort as the author's 2011 study [7]. Additionally, the study conducted by Sacomori *et al.* was not included in sex- and disease-specific prevalence analyses due to the absence of stratified prevalence data [29].

A comprehensive overview of prevalence rates categorized by age group and disease type is provided in the Supplementary Material (*Supplementary Tables 2-10*), while study characteristics and UI prevalence are summarized in *Supplementary Table 11*.

The overall risk of bias in the included studies was high due to several methodological limitations. One major issue was the frequent absence of control groups, which limited the interpretability of prevalence data. Additionally, deficiencies in eligibility criteria were common; in many cases, inclusion and exclusion parameters were not explicitly stated, and some studies failed to exclude conditions that could act as confounding factors. The validity of outcome measurements was another concern, as numerous studies did not employ standardized or validated UI assessment tools, thereby increasing the risk of measurement bias. Confounding factors were also poorly controlled in most studies. In particular, some studies failed to exclude individuals with neurological conditions, which are a well-established risk factor for UI. Since all included studies were observational, they were classified as low quality according to the GRADE approach. Given the high prevalence of bias and the absence of methodological elements that could enhance evidence quality, the overall confidence in the findings remained low. The assessment of risk of bias and evidence quality is summarized in *Supplementary Table 12*.

An evaluation based on the STROBE checklist revealed several reporting deficiencies. The methods section was often incomplete, with only 3 studies explicitly identifying potential biases and discussing mitigation strategies. Study design definitions were frequently vague; although 11 studies provided descriptions of their methodology, they did not clearly define their study design, an omission that was also commonly reflected in the abstracts.

A further issue related to participant eligibility criteria is that 8 studies did not provide sufficient details about the selection process. While sample sizes were reported, the criteria used for participant recruitment were often unclear. Additionally, the discussion of study results lacked depth in many cases; 10 studies failed to address limitations, sources of bias, or the imprecision of findings. Transparency regarding funding sources was also inadequate, with only 8 studies disclosing financial support.

Despite these shortcomings, most studies adhered to at least 75% of the STROBE checklist recommendations. A summary of the reporting bias evaluation is provided in *Supplementary Table 13*.

Discussion

This review aimed to determine the prevalence of UI in patients with chronic cough. Due to variations in the populations studied across different publications, it was not possible to establish a unified prevalence rate. However, these variations require analysis, as they are not solely attributable to differences in sample characteristics.

For instance, in female patients aged 18-45 with CF, the prevalence of UI reported by Moran *et al.* was 30.4% [24], whereas Vella *et al*. found a prevalence of 74% in a similar population [31]. The first notable difference between these studies lies in the data collection methods: Moran *et al*. employed a non-validated, study-specific questionnaire [24], whereas Vella *et al*. used the King's Health Questionnaire, which explicitly defines SUI as "urine leakage during physical activities such as coughing or running" [31].

A second key discrepancy is the definition of UI, which was absent in the study conducted by Moran *et al*. [24]. Although UI definitions have remained relatively stable over the past 25 years, their application and clinical interpretation are not uniform. Schnell *et al.* [30], for example, defined UI as "involuntary urine loss occurring at least twice per month". The inclusion of a clear UI definition in studies is essential to prevent misinterpretation and enable accurate comparisons.

A precise definition is also crucial for patient awareness. Many

Table 1. Urinary incontinence prevalence analyzed according to age, sex, and disease type. Weighted averages calculated to adjust for sample size.

Disease	<18 years			18-45 years			45+ years		
	Males	Females	Mixed	Males	Females	Mixed	Males	Females	Mixed
COPD							145/630 23% D, H, I	213/418 51% E, I	651/1754 37% I, U, V
CF	1/46 2.2% A	62/228 27% A, O, Q, S, T	37/153 24.1% A, B	20/215 9.3% C, M, W	379/617 61% E, F, M, N, O, P, T, Z, W	109/371 29.4% M, T, W			
Chronic cough								244/357 68.3% X, G	
Other respiratory diseases		4/25 16% S	17/55 30% B						21/62 33.9% U
Healthy control groups		2/27 7% S	12/56 20% B	8/80 10% C	38/69 55% E		6/36 17% D		4048/14828 27.3% V

COPD, chronic obstructive pulmonary disease; CF, cystic fibrosis; A, Blackwell *et al.* [12]; B, Browne *et al.* [13]; C, Burge *et al.* [14]; D, Burge *et al.* [15]; E, Button *et al.* [16]; F, Cornacchia *et al.* [17]; G, Dicpinigaitis *et al.* [18]; H, Hirayama *et al.* [19]; I, Hrisanfow *et al.* [7]; M, Hubeaux *et al.* [21]; N, Korzeniewska-Eksterowicz *et al.* [22]; O, Mariani *et al.* [23]; P, Moran *et al.* [24]; Q, Nixon *et al.* [25]; S, Prasad *et al.* [27]; T, Reichman *et al.* [28] U, Sacomori *et al.* [29]; V, Schnell *et al.* [30];W, White *et al.* [32]; X, Arismendi *et al.* [33]; Z, Vella *et al.* [31].

individuals mistakenly believe UI refers only to complete involuntary bladder emptying, failing to recognize that minor leaks (often termed "drops") also constitute UI. Such minor leakage, particularly if due to pelvic floor muscle weakness, can often be managed with appropriate perineal rehabilitation [16].

This misconception was evident in studies included in this review. Mariani *et al.* and White *et al*. reported inconsistencies in questionnaire responses [23,32]. In the study conducted by Mariani *et al.* [23], 2 patients initially denied experiencing leakage but later affirmed urine loss during coughing. Similarly, 3 patients denied having UI but subsequently acknowledged small urine leaks. White *et al.* observed a comparable pattern [32]: 2 patients denied leakage in one question but reported small leaks in a subsequent one. Additionally, 3 patients who answered "never" to the question "How often do you experience urine loss?" later reported UI during coughing.

It is important to note that in both studies, patients completed the questionnaires independently. The presence of a healthcare professional could improve accuracy by guiding patients through the questionnaire and clarifying ambiguities, as well as ensuring a standardized definition of UI.

Despite these variations, the prevalence of UI in CF patients is significantly higher than in the general population. In a study by Wu *et al.* [35], the prevalence of UI in a sample of 3563 women aged 20-49 years ranged from 3.5% to 15%. By contrast, the studies reviewed here reported an average prevalence of 61% for the same age group, as seen in *Supplementary Table 4*.

A similarly elevated UI prevalence was observed in patients with COPD. Given the different disease progression and natural history of COPD compared to CF, the average age of the studied population exceeded 60 years, with a UI prevalence of 51%. Wu *et al*. found UI prevalence in women aged 50-79 years to be 11-16.5%, approximately one-quarter to one-third of that observed in COPD patients [35].

In male COPD patients, the average UI prevalence was around 20%, with Burge *et al*. reporting a rate of 39%. Given the age distribution of this cohort, these prevalence rates are significantly higher than in the healthy population. Kwong *et al*. identified a UI prevalence of 12-15% among men aged 70-79 years, underscoring the impact of COPD on urinary function [36].

The prevalence of UI remains uncertain in pediatric populations (<18 years). Due to significant sex differences in UI prevalence, studies must be stratified accordingly. In girls, the literature suggests an average prevalence of 16-27%, considerably higher than the 7% observed in a healthy control group in the study conducted by Prasad *et al*. [27]. In boys, the only data available from this review comes from Blackwell *et al.* [12], reporting a UI prevalence of 2.2%, which aligns with the findings by Nieuwhof-Leppink *et al*. [37], where pediatric UI prevalence ranged from 1.1% to 9%.

UI prevalence is also uncertain in males, particularly in young adults (18-45 years), due to a lack of dedicated studies. Burge *et al*. reported a 10% prevalence in healthy individuals, consistent with the 9.3% prevalence observed in CF cohorts [15].

This review could not establish a direct correlation between lower FEV1% and UI development. In CF patients, given the progressive nature of the disease, FEV1% declines over time. This suggests that UI may be more associated with patient age and prolonged chronic coughing rather than lung function alone. The omission of FEV1% assessment in several studies is thus understandable, as previous research (including 7 publications in this review) found no statistically significant correlation.

However, studies by Nixon *et al*., Moran *et al.*, and Prasad *et al.* noted that at least one-third of UI patients reported symptom exacerbation due to respiratory physiotherapy [24,25,27]. Many also stated that UI interfered with performing respiratory exercises and pulmonary tests. Additionally, patients modified their behavior to mitigate UI, including increasing voiding frequency, suppressing coughing, and reducing physical activity. The findings in the study conducted by Hubeaux *et al.* highlighted that UI not only led to suboptimal expiratory efforts but also caused discomfort and embarrassment [21].

The absence of BMI assessment in studies is not due to its questionable relevance. As demonstrated in multiple studies, including those in the meta-analysis by Shang *et al*. [38], BMI is a well-recognized risk factor for UI. Omitting BMI evaluation significantly reduces study quality. This review confirmed the importance of BMI, as 3 studies on COPD patients found that overweight individuals had twice the risk of developing UI.

A novel perspective on BMI was provided by Prasad *et al*. [27], whose study focused on CF patients. These individuals often experience underweight conditions due to malabsorption caused by pancreatic exocrine dysfunction [39]. The study highlighted that a BMI below 18.5 is also a risk factor for UI. Malnutrition can lead to constipation, as suggested by O'Keeffe *et al.* [40], which is a recognized risk factor. Chronic constipation requires repeated straining during defecation, increasing intra-abdominal pressure and placing additional stress on the pelvic floor over time [41].

Pregnancy is another critical BMI-related factor. Rapid weight gain during pregnancy creates pelvic floor stress, and childbirth further increases UI risk. Failure to consider pregnancy and childbirth as confounding factors decreases study reliability. For instance, Button *et al*. found a UI prevalence of 55% in the control cohort *vs.* 70% in CF patients and 71% in COPD patients [16]. Their logistic regression model matched for age but did not account for parity, a significant study limitation. A comparison of the healthy population (74% had given birth) and those with respiratory conditions (32% had given birth) underscores this issue. Even within COPD patients, despite a higher birth prevalence (67%) than the healthy group, UI prevalence remained higher in the COPD cohort (71% *vs*. 55%).

Pregnancy is also a critical factor when comparing CF patients to healthy individuals outside the same study. In general prevalence studies. Chronic cough is often not excluded as a confounding factor, which may distort prevalence rates and pregnancy is frequently overlooked. In the study conducted by Button *et al.* [16], only 8% of women with CF had given birth, an atypically low rate for healthy women. This discrepancy may stem from the genetic nature of CF, which discourages pregnancy, and the disease's impact on life expectancy. Pregnancy and childbirth impose significant physical stress, often dissuading already vulnerable CF patients. Recognizing pregnancy as a UI risk factor is essential when comparing CF populations to healthy controls.

When comparing UI prevalence in diseased *vs.* healthy cohorts, age should be viewed not just as a numerical factor but as an indicator of female hormonal status. In particular, comparing healthy cohorts to patients in menopause is flawed, as menopause correlates with estrogen decline, leading to transient or permanent UI. In contrast, UI in chronic cough patients is inherently persistent [42]. Consequently, menopause-related hormonal shifts must be accounted for to ensure accurate UI prevalence comparisons between study populations.

In conclusion, BMI, pregnancy, and hormonal status significantly influence UI prevalence. Failure to consider these factors compromises study validity and may lead to inaccurate comparisons between diseased and healthy populations. Future research should incorporate these elements to enhance reliability and improve UI risk assessments.

The analysis must also consider the social stigma associated with perineal disorders [43], which may influence study participation. For instance, Vella *et al.* had a 67% participation rate [31], while in the study conducted by Prasad *et al.*, 25% of eligible patients declined participation [27]. Since these studies relied on non-invasive questionnaires, reluctance cannot be attributed to invasive testing. It remains unclear whether refusal was due to the absence of UI or embarrassment linked to discussing urogenital issues. In either case, UI prevalence figures would be affected.

Another concern is that many of the studies reviewed are over 20 years old. Despite UI and pelvic floor disorders being extensively studied for over 50 years, UI remains underexplored in medical and physiotherapeutic assessments. This could be linked to the near absence of UI in clinical guidelines. Major reference guidelines, such as GOLD [34] and Global Initiative for Asthma [44], as well as educational brochures from national health organizations, fail to mention UI as a potential consequence of chronic coughing. They also lack recommendations for healthcare providers to assess UI as a secondary symptom. Many studies in this review were the first instances where UI was investigated in the centers where they were conducted.

Italian guidelines for CF management similarly fail to acknowledge UI as an issue requiring assessment or treatment [45]. Furthermore, UI is not considered in exercise recommendations, even though physical activity can exacerbate the condition [46]. Informational brochures for children and adolescents with CF also omit UI as a possible complication. A review of multiple brochures [47-50] revealed that UI is mentioned in only one article [51], which lacks diagnostic and management guidance for clinicians and does not encourage patients to report symptoms. This omission contrasts with Australian [52] and UK [53, 54] guidelines, which explicitly recognize UI, recommend its assessment and management, and suggest referring patients to specialists.

The failure to address UI in chronic cough patients is even more striking when considering standard UI evaluation protocols. One commonly used test, the stress test, includes maneuvers such as coughing to provoke UI and confirm its presence. This test demonstrates that coughing is already recognized as a risk factor for UI. However, in patients with chronic cough, the condition remains poorly investigated.

As previously noted, patients often struggle to disclose UI due to social stigma. A direct inquiry by the clinician, along with a clear explanation of the International Continence Society's UI definition (referenced in the introduction), could yield more accurate prevalence data and facilitate open discussions about the condition.

Recognizing UI in these patients could lead to therapeutic, educational, and rehabilitative interventions aimed at resolving the issue. A recent study has demonstrated that physiotherapy can reduce UI symptoms [55]. Addressing UI is crucial, especially given its established correlation with decreased quality of life [56].

For a proper analysis of the data emerging from this review, it is essential to highlight the low methodological quality and high bias present in the included studies. Notably, only one-third of the publications included a control group. While a comparison of UI prevalence between populations with respiratory diseases and healthy populations can be derived from the literature, it is challenging to ensure comparability under identical environmental, sociocultural, and methodological conditions (*e.g.*, the questionnaires used). This inevitably reduces the quality of the evidence included in the review and the reliability of the review itself.

Additionally, the use of different questionnaires across studies, some of which are not validated, represents a limitation in the comparability of results.

Finally, the poor control of confounding factors, as revealed by the application of the GRADE assessment scale (*Supplementary Table 12*), makes the results less reliable, as discussed in detail above.

Study limitations

One of the main strengths of this study, considering its initial design, is the search strategy, which allowed for the inclusion of nearly all prevalence studies relevant to the review.

Despite the presence of multiple confounding factors, the study successfully highlighted an increased prevalence of UI in patients with diseases causing chronic cough.

Furthermore, the analysis identified additional factors influencing UI that are not always adequately considered or are mistakenly deemed irrelevant. For example, BMI and pregnancy have proven to be fundamental variables in UI prevalence analysis, but were not appropriately weighted in all the examined studies.

Conclusions

The primary objective of this review - investigating the prevalence of UI in patients with diseases causing chronic cough - has been met. The findings indicate that the female population is more affected by UI, with prevalence rates often twice as high as those in healthy counterparts. However, it was not possible to provide a unified prevalence estimate for pediatric and male populations, highlighting the need for future research in these groups.

Future studies should also carefully evaluate potential confounding factors to provide a more accurate picture of the condition. Nevertheless, the results obtained emphasize the significant presence of an issue that remains underestimated and overlooked. These findings should be considered and integrated into clinical practice, including through improved patient information *via* brochures and the development of more comprehensive clinical guidelines.

Action by healthcare professionals is crucial, as stigma surrounding the genital area and a lack of awareness about available treatments may hinder patients from reporting their condition; fostering patient-clinician communication would significantly enhance patient care and quality of life.

Directions for future research

Future research must improve reporting quality, as evidenced by the deficiencies highlighted in *Supplementary Table 13*. Specifically, it will be necessary to acknowledge potential study biases, clarify participant selection criteria, analyze study limitations, and disclose funding sources where applicable.

It would be beneficial to exclusively use validated tools for UI prevalence analysis, increase sample sizes, and include a control group to enhance the quality of the evidence.

Additionally, greater attention should be given to potential confounding factors, particularly BMI and pregnancy. In studies focusing solely on healthy populations, chronic cough should be considered a risk factor due to its destructive impact on the pelvic floor. Including it would allow for more accurate prevalence comparisons with populations affected by respiratory diseases.

Young male populations (18-45 years) and pediatric populations should also be investigated more thoroughly to obtain more precise prevalence data for both individuals with chronic cough-related diseases and their healthy counterparts.

Finally, clinical inquiry should be initiated by healthcare professionals, considering that the sensitivity of the topic, social stigma, and lack of awareness regarding therapeutic options may prevent patients from spontaneously reporting the condition.

Implications for clinical practice

This review provides prevalence data that underscore the need to give greater consideration to the impact of UI in patients with chronic respiratory diseases. Furthermore, this review suggests that in individuals with chronic cough, fear of urine leakage during exertion may reduce adherence to prescribed both breathing and physical exercise programs and may also compromise the reliability and reproducibility of spirometry, particularly FEV1%. The review also highlights the substantial social consequences of UI, such as depression and social isolation, which contribute to a marked decline in quality of life.

Given the stigma surrounding UI and the possibility that patients may not recognise or report symptoms spontaneously, UI screening should be proactively initiated by clinicians. Identifying UI is clinically meaningful because it signals a potentially treatable comorbidity and enables targeted counselling, timely referral to appropriate specialist care, and integration of UI management strategies within respiratory physiotherapy. Incorporating routine, sensitive screening, and clear patient education may therefore improve engagement with prescribed programs, support more accurate respiratory testing, and ultimately enhance patient-centered outcomes.

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Online supplementary material:
Supplementary Table 1. Adapted search strings and filters used for each database investigated.
Supplementary Table 2. Urinary incontinence prevalence in patients with chronic obstructive pulmonary disease. Age range 45+ years.
Supplementary Table 3. Urinary incontinence prevalence in patients with cystic fibrosis. Age range <18 years.
Supplementary Table 4. Urinary incontinence prevalence in patients with cystic fibrosis. Age range 18-45 years.
Supplementary Table 5. Urinary incontinence prevalence in patients with other respiratory diseases. Age range <18 years.
Supplementary Table 6. Urinary incontinence prevalence in patients with other respiratory diseases. Age range 45+ years.
Supplementary Table 7. Urinary incontinence prevalence in healthy control groups. Age range <18 years.
Supplementary Table 8. Urinary incontinence prevalence in healthy control groups. Age range 18-45 years.
Supplementary Table 9. Urinary incontinence prevalence in healthy control groups. Age range 45+ years.
Supplementary Table 10. Urinary incontinence prevalence in women with chronic cough. Age range 45+ year.
Supplementary Table 11. Characteristics and results of studies included in the systematic review.
Supplementary Table 12. Risk of bias and quality of evidence of the reviewed studies according to the GRADE approach.
Supplementary Table 13. Application of the STROBE checklist to the studies included in the review.

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