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# SUPPLEMENTARY MATERIAL

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

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

## 1. Base string

(incont* AND urin*) AND (((chronic* AND (pulmon* OR lung* OR respirat*) AND (diseas* OR conditio* OR illnes OR problem OR disorder)) OR (chronic* AND cough*) OR ("Postnasal drip" OR "Upper airway cough syndrome" OR "UACS" OR "Asthma" OR "Gastroesophageal reflux disease" OR "GERD" OR "Chronic obstructive pulmonary disease" OR "COPD" OR "Bronchiectasis" OR "Cystic fibrosis" OR "Laryngopharyngeal reflux" OR "Sarcoidosis" OR "Idiopathic pulmonary fibrosis" OR "IPF")))

## 2. Adapted search string

**Supplementary Table 1. Adapted search strings and filters used for each database investigated.**

| Database | Search string | Filters |
|---|---|---|
| Pubmed | (incont*[Title/Abstract] AND urin*[Title/Abstract]) AND (((chronic*[Title/Abstract] AND (pulmon*[Title/Abstract] OR lung*[Title/Abstract] OR respirat*[Title/Abstract]) AND (diseas*[Title/Abstract] OR conditio*[Title/Abstract] OR illnes[Title/Abstract] OR problem[Title/Abstract] OR disorder[Title/Abstract])) OR (chronic*[Title/Abstract] AND cough*[Title/Abstract]) OR ("Postnasal drip"[Title/Abstract] OR "Upper airway cough syndrome"[Title/Abstract] OR "UACS"[Title/Abstract] OR "Asthma"[Title/Abstract] OR "Gastroesophageal reflux disease"[Title/Abstract] OR "GERD"[Title/Abstract] OR "Chronic obstructive pulmonary disease"[Title/Abstract] OR "COPD"[Title/Abstract] OR "Bronchiectasis"[Title/Abstract] OR "Cystic fibrosis"[Title/Abstract] OR "Laryngopharyngeal reflux"[Title/Abstract] OR "Sarcoidosis"[Title/Abstract] OR "Idiopathic pulmonary fibrosis"[Title/Abstract] OR "IPF"[Title/Abstract])) | Full text; English |
| Embase | incont*:ab,ti AND urin*:ab,ti AND (chronic*:ab,ti AND (pulmon*:ab,ti OR lung*:ab,ti OR respirat*:ab,ti) AND (diseas*:ab,ti OR conditio*:ab,ti OR illnes:ab,ti OR problem:ab,ti OR disorder:ab,ti) OR (chronic*:ab,ti AND cough*:ab,ti) OR 'postnasal drip':ab,ti OR 'upper airway cough syndrome':ab,ti OR 'uacs':ab,ti OR 'asthma':ab,ti OR 'gastroesophageal reflux disease':ab,ti OR 'gerd':ab,ti OR 'chronic obstructive pulmonary disease':ab,ti OR 'copd':ab,ti OR 'bronchiectasis':ab,ti OR 'cystic fibrosis':ab,ti OR 'laryngopharyngeal reflux':ab,ti OR 'sarcoidosis':ab,ti OR 'idiopathic pulmonary fibrosis':ab,ti OR 'ipf':ab,ti) | |
| EBSCO | TI ( (incont* AND urin*) AND (((chronic* AND (pulmon* OR lung* OR respirat*) AND (diseas* OR conditio* OR illnes OR problem OR disorder)) OR (chronic* AND cough*) OR ("Postnasal drip" OR "Upper airway cough syndrome" OR "UACS" OR "Asthma" OR "Gastroesophageal reflux disease" OR "GERD" OR "Chronic obstructive pulmonary disease" OR "COPD" OR "Bronchiectasis" OR "Cystic fibrosis" OR "Laryngopharyngeal reflux" OR "Sarcoidosis" OR "Idiopathic pulmonary fibrosis" OR "IPF"))) ) OR AB ( (incont* AND urin*) AND (((chronic* AND (pulmon* OR lung* OR respirat*) AND (diseas* OR conditio* OR illnes OR problem OR disorder)) OR (chronic* AND cough*) OR ("Postnasal drip" OR "Upper airway cough syndrome" OR "UACS" OR "Asthma" OR "Gastroesophageal reflux disease" OR "GERD" OR "Chronic obstructive pulmonary disease" OR "COPD" OR "Bronchiectasis" OR "Cystic fibrosis" OR "Laryngopharyngeal reflux" OR "Sarcoidosis" OR "Idiopathic pulmonary fibrosis" OR "IPF"))) ) | Full text |
| Cochrane | (incont* AND urin*) AND (((chronic* AND (pulmon* OR lung* OR respirat*) AND (diseas* OR conditio* OR illnes OR problem OR disorder)) OR (chronic* AND cough*) OR ("Postnasal drip" OR "Upper airway cough syndrome" OR "UACS" OR "Asthma" OR "Gastroesophageal reflux disease" OR "GERD" OR "Chronic obstructive pulmonary disease" OR "COPD" OR "Bronchiectasis" | |

| | | |
|---|---|---|
| | OR "Cystic fibrosis" OR "Laryngopharyngeal reflux" OR "Sarcoidosis" OR "Idiopathic pulmonary fibrosis" OR "IPF"))) | |
| Scopus | ( TITLE ( ( incont* AND urin* ) AND ( ( ( chronic* AND ( pulmon* OR lung* OR respirat* ) AND ( diseas* OR conditio* OR illnes OR problem OR disorder ) ) OR ( chronic* AND cough* ) OR ( "Postnasal drip" OR "Upper airway cough syndrome" OR "UACS" OR "Asthma" OR "Gastroesophageal reflux disease" OR "GERD" OR "Chronic obstructive pulmonary disease" OR "COPD" OR "Bronchiectasis" OR "Cystic fibrosis" OR "Laryngopharyngeal reflux" OR "Sarcoidosis" OR "Idiopathic pulmonary fibrosis" OR "IPF" ) ) ) ) OR ABS ( ( incont* AND urin* ) AND ( ( ( chronic* AND ( pulmon* OR lung* OR respirat* ) AND ( diseas* OR conditio* OR illnes OR problem OR disorder ) ) OR ( chronic* AND cough* ) OR ( "Postnasal drip" OR "Upper airway cough syndrome" OR "UACS" OR "Asthma" OR "Gastroesophageal reflux disease" OR "GERD" OR "Chronic obstructive pulmonary disease" OR "COPD" OR "Bronchiectasis" OR "Cystic fibrosis" OR "Laryngopharyngeal reflux" OR "Sarcoidosis" OR "Idiopathic pulmonary fibrosis" OR "IPF" ) ) ) ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) ) | English |
| ProQuest | abstract((incont* AND urin*) AND (((chronic* AND (pulmon* OR lung* OR respirat*) AND (diseas* OR conditio* OR illnes OR problem OR disorder)) OR (chronic* AND cough*) OR ("Postnasal drip" OR "Upper airway cough syndrome" OR "UACS" OR "Asthma" OR "Gastroesophageal reflux disease" OR "GERD" OR "Chronic obstructive pulmonary disease" OR "COPD" OR "Bronchiectasis" OR "Cystic fibrosis" OR "Laryngopharyngeal reflux" OR "Sarcoidosis" OR "Idiopathic pulmonary fibrosis" OR "IPF")))) OR title((incont* AND urin*) AND (((chronic* AND (pulmon* OR lung* OR respirat*) AND (diseas* OR conditio* OR illnes OR problem OR disorder)) OR (chronic* AND cough*) OR ("Postnasal drip" OR "Upper airway cough syndrome" OR "UACS" OR "Asthma" OR "Gastroesophageal reflux disease" OR "GERD" OR "Chronic obstructive pulmonary disease" OR "COPD" OR "Bronchiectasis" OR "Cystic fibrosis" OR "Laryngopharyngeal reflux" OR "Sarcoidosis" OR "Idiopathic pulmonary fibrosis" OR "IPF")))) | Full text;<br>English |
| OvID | (incont* and urin* and ((chronic* and (pulmon* or lung* or respirat*) and (diseas* or conditio* or illnes or problem or disorder)) or (chronic* and cough*) or ("Postnasal drip" or "Upper airway cough syndrome" or "UACS" or "Asthma" or "Gastroesophageal reflux disease" or "GERD" or "Chronic obstructive pulmonary disease" or "COPD" or "Bronchiectasis" or "Cystic fibrosis" or "Laryngopharyngeal reflux" or "Sarcoidosis" or "Idiopathic pulmonary fibrosis" or "IPF"))).ab. or (incont* and urin* and ((chronic* and (pulmon* or lung* or respirat*) and (diseas* or conditio* or illnes or problem or disorder)) or (chronic* and cough*) or ("Postnasal drip" or "Upper airway cough syndrome" or "UACS" or "Asthma" or "Gastroesophageal reflux disease" or "GERD" or "Chronic obstructive pulmonary disease" or "COPD" or "Bronchiectasis" or "Cystic fibrosis" or "Laryngopharyngeal reflux" or "Sarcoidosis" or "Idiopathic pulmonary fibrosis" or "IPF"))).at. | Full text;<br>English |
| PEDro | | Problem: incontinence<br>Body Part: perineum or genito-urinary system<br>Topic: chronic respiratory disease<br>Return: 50 records at a time<br>When Searching: AND |

## 3. Prevalence tables

**Supplementary Table 2. Urinary incontinence prevalence in patients with chronic obstructive pulmonary disease. Age range 45+ years.**

**MALES**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Burge A.T. (2016) | 71 | 19/49 (39) |
| Hirayama F. (2008) | 67 | 24/244 (10) |
| Hrisanfow E. (2011) | 65 | 102/337 (30.3) |
| | | 145/630 **(23)** |

**FEMALES**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Button B.M. (2019) | 63 | 19/27 (70) |
| Hrisanfow E. (2011) | 65 | 194/391 (49.6) |
| | | 213/418 **(51)** |

**MIXED POPULATION**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Hrisanfow E. (2011) | 65 | 296/728 (41) |
| Sacomori C. (2020) | 62 | 8/31 (25.8) |
| Schnell K. (2012) | 63 | 347/995 (34.9) |
| | | 651/1754 **(37.1)** |

**Supplementary Table 3. Urinary incontinence prevalence in patients with cystic fibrosis. Age range <18 years.**

**MALES**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Blackwell K. (2005) | 5-18 | 1/46 (2.2) |
| | | 1/46 **(2.2)** |

**FEMALES**

| AUTHOR (years) | AGE in years | P (%) |
|---|---|---|
| Blackwell K. (2005) | 5-18 | 8/26 (31) |
| Mariani A. (2021) | 13 | 12/82 (15) |
| Nixon G.M. (2002) | 15 | 25/55 (45) |
| Prasad S.A. (2006) | 14 | 17/51 (33) |
| Reichman G. (2015) | 8 | 0/14 (0) |
| | | 62/228 **(27)** |

**MIXED POPULATION**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Blackwell K. (2005) | 5-18 | 9/72 (13) |
| Browne W.J. (2009) | 12 | 28/81 (35) |
| | | 37/153 **(24.1)** |

**Supplementary Table 4. Urinary incontinence prevalence in patients with cystic fibrosis. Age range 18-45 years.**

**MALES**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Burge A.T. (2015) | 30 | 12/80 (15) |
| Hubenaux K. (2024) | 31 | 7/93 (7.5) |
| White D. (2000) | 25 | 1/42 (2.4) |
| | | 20/215 **(9.3)** |

**FEMALES**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Button B.M. (2019) | 32 | 27/38 (71) |
| Cornacchia M. (2001) | 25 | 104/176 (59) |
| Hubenaux K. (2024) | 31 | 54/85 (63.5) |
| Korzeniewska-Eksterowicz A. (2014) | 20 | 28/36 (44) |
| Mariani A. (2021) | 24.5 | 39/71 (55) |
| Moran F. (2003) | 25 | 14/46 (30.4) |
| Reichman G. (2015) | 26 | 26/38 (68) |
| Vella M. (2009) | 28 | 73/98 (74) |
| White D. (2000) | 25 | 14/29 (48) |
| | | 379/617 **(61)** |

**MIXED POPULATION**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Hubenaux K. (2024) | 31 | 61/178 (34.3) |
| Reichman G. (2015) | 26 | 33/122 (27) |
| White D. (2000) | 26 | 15/71 (21) |
| | | 109/371 **(29.4)** |

**Supplementary Table 5. Urinary incontinence prevalence in patients with other respiratory diseases. Age range <18 years.**

**MALES**

**FEMALES**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Prasad S.A. (2006) | 14 | 4/25 (16) |
| | | 4/25 **(16)** |

**MIXED POPULATION**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Browne W.J. (2009) | 13 | 17/55 (30) |
| | | 17/55 **(30)** |

**Supplementary Table 6. Urinary incontinence prevalence in patients with other respiratory diseases. Age range 45+ years.**

**MALES**

**FEMALES**

**MIXED POPULATION**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Sacomori C. (2020) | 62 | 21/62 (33.9) |
| | | 21/ 62 **(33.9)** |

**Supplementary Table 7. Urinary incontinence prevalence in healthy control groups. Age range <18 years.**

**MALES**

**FEMALES**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Prasad S.A. (2006) | 14 | 2/27 (7) |
| | | 2/27 **(7)** |

**MIXED POPULATION**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Browne W.J. (2009) | 13 | 12/56 (20) |
| | | 12/56 **(20)** |

**Supplementary Table 8. Urinary incontinence prevalence in healthy control groups. Age range 18-45 years.**

**MALES**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Burge A.T. (2015) | 31 | 8/80 (10) |
| | | 8/80 **(10)** |

**FEMALES**

| AUTHOR (years) | AGE in years | P (%) |
|---|---|---|
| Button B.M. (2019) | 43 | 38/69 (55) |
| | | 38/69 **(55)** |

**MIXED POPULATION**

**Supplementary Table 9. Urinary incontinence prevalence in healthy control groups. Age range 45+ years.**

**MALES**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Burge A.T. (2016) | 66 | 6/36 (17) |
| | | 6/36 **(17)** |

**FEMALES**

**MIXED POPULATION**

| AUTHOR (year) | AGE in years | P (%) |
|---|---|---|
| Schnell K. (2012) | 60 | 4048/14828 (27.3) |
| | | 4048/14828 **(27.3)** |

**Supplementary Table 10. Urinary incontinence prevalence in women with chronic cough. Age range 45+ year.**

**MALES**

**FEMALES**

| AUTHOR (years) | AGE in years | P (%) |
|---|---|---|
| Arismendi E. (2024) | 58 | 111/147 (75) |
| Dicpinigaitis P.V. (2021) | 61 | 133/210 (63.3) |
| | | 244/357 **(68.3)** |

**MIXED POPULATION**

## 4. Result table

### Supplementary Table 11. Characteristics and results of studies included in the systematic review.

| Author and year<br><br>Study design<br><br>Observation period | Sample characteristics: size and sex distribution by pathology | Inclusion and exclusion criteria | Age | RISK FACTORS | | Data collection method | RESULTS |
|---|---|---|---|---|---|---|---|
| | | | | $FEV_1$ (percentage of predicted value) | BMI | | Definition and prevalence of urinary incontinence (UI) |
| Arismendi<br>2024<br><br>Retrospective, multicenter, non-interventional study<br>NR | 147<br>147F / 0M<br><br>Chronic cough | Inclusion criteria: females aged >18 years.<br><br>Exclusion criteria: active smokers or individuals who had stopped smoking in the previous 12 months; treatment with ACE inhibitors; chronic cough related to COPD, cancer, active infection, bronchiectasis, interstitial lung disease, cystic fibrosis, or Gilles de la Tourette syn- drome; current participation in interventional studies; or conditions that, in the judgment of the treating physician, advised against participation. | 57.9 years | NA | SUI: 28.5<br><br>No SUI: 26.1 | Printed survey completed without investigator or treating physician overview. | UI not defined.<br><br>UI frequency:<br><br>never/hardly ever: 36 (24.5%);<br>rarely: 17 (11.6%);<br>some- times: 38 (25.9%);<br>frequently: 30 (20.4%);<br>mostly/ always: 26 (17.7%). |
| Blackwell K.<br>2005<br><br>ND<br><br>NR | 72<br>26F / 46M<br>Only CF | All patients from the referral center were included | 5-18 year | #<br>SUI: 84,7%<br>No SUI: 89,7% | NA | Postal questionnaire followed by a detailed questionnaire administered through an interview.<br>The specific questions asked were not reported. | "Involuntary urinary loss"<br><br>9/72 (13%)<br>8/26 (31%) F<br>1/46 (2.2%) M<br>Only SUI included. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Browne W.J.<br>2009<br><br>ND<br><br>NR | 194<br>85F / 107M | Children and/or caregivers who do not understand written or spoken English were excluded. | 9-16 years | # | NR # | Anonymous questionnaire on prevalence, severity, impact, and other factors involved in UI.<br>Self-completed in the clinic. | "Involuntary urinary loss at least one time"<br>CF: 28/81 (35%)<br>Other respiratory disease: 17/55 (30%)<br>Controls: 12/56 (20%)<br>"Involuntary urinary loss more than one time"<br>CF: 17/81 (21%) of which 11F<br>Other respiratory disease: 12/55 (22%) of which 4F<br>19% F<br>Controls: 10/56 (17%) of which 7F<br><br>No statistically significant differences. |
| | CF: 81<br>36 F / 45 M | | 12.1 years F<br>12.6 years M | 89.24% | | | |
| | Other respiratory disease: 55<br>21F / 45M | | 12.3 years F<br>12.9 years M | 92.92% | | | |
| | Controls: 56<br>28F / 28M | Children with other respiratory diseases or neurological conditions excluded. | 11.39 years F<br>12.88 years M | NA | | | |
| Burge A.T.<br>2015<br><br>Prospective observational study<br>NR | 160<br>0F / 160M | Patients with cognitive impairment, lack of language proficiency, or any other issue preventing independent questionnaire completion were excluded. | # | | * | ICIQ-SF<br>ICIQ-MLUTS<br><br>Self-administered. | "Involuntary urinary loss"<br><br>CF 12/80 (15%)<br>Controls 8/80 (10%)<br><br>Statistically significant difference (IC: 95%) if the overall presence of UI is considered.<br>A statistically significant difference was observed when evaluating the presence of SUI.<br>(5/80 (6.3%) in CF;<br>0/80 (0%) in controls). |
| | CF: 80M | | 30 years | 64.4% with UI<br>62% without UI | 22 | | |
| | Controls: 80M | Patients aged ≥18 years were included.<br>Patients with a diagnosed respiratory disease or those who smoked more than 10 pack-years were excluded. | 31 years | NA | 25 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Burge A.T.<br>2016<br><br>Prospective observational study<br><br>NR | 0F / 85M | Patients with cognitive deficits, language barriers, or other issues preventing independent questionnaire completion were excluded. | * | | # | ICIQ-SF<br>ICIQ-MLUTS<br><br>Self administered. | "Involuntary urinary loss"<br><br>Statistically significant difference: $p < 0.05$; age and $FEV_1$ are positively correlated with the development of UI.<br>25/85 (29.4%)<br>COPD: 19/49 (39%)<br>Controls: 6/36 (17%) |
| | COPD: 49M | Patients with spirometry-confirmed COPD diagnosis and stable clinical status were included. | 71 years | 38% with UI<br>61% without UI<br><br>*. | 27 | | |
| | Controls: 36M | Patients with respiratory disease diagnosis or a smoking history of more than 10 cigarettes per day were excluded. | 66 years | NA | 28 | | |
| Button B.M.<br>2019<br><br>Prospective observational study and subsequent intervention<br>NR | 134F | Inclusion criteria: women aged 18 to 70 years, capable of reading and writing in English.<br>Exclusion criteria: ongoing pregnancy. | | # | | Questionario postale a pazienti con CF.<br><br>Questionario consegnato a mano per pazienti con BPCO.<br><br>Questionario compilato in autonomia o con supporto telefonico di un clinico. | "Involuntary urinary loss"<br><br>84/134 (62.7%)<br>CF 27/38 (71%)<br>COPD 19/27 (70%)<br>Controls 38/69 (55%)<br><br>Urinary incontinence was significantly more prevalent ($p<0.05$) in patients with CF compared to age-matched controls.<br>Logistic regression showed that age, BMI, and respiratory disease diagnosis are risk factors that double the probability of developing UI. |
| | CF: 38 | Exclusion criteria: ongoing pregnancy. | 32 years | No UI: 66%<br>UI: 56% | 22 | | |
| | COPD: 27 | Individuals with ongoing exacerbations were excluded. | 63 years | no UI: 49%<br>UI: 67% | 26 | | |
| | Controls: 69 | Patients with respiratory disease diagnosis were excluded. | 43 years | NA | 24 | | |
| Cornacchia M.<br>2001 | 176 F<br>Only CF | Patients aged at least 15 years old were included. | Mean age: 24.6 years (*). | * | NA | Anonymous questionnaire regarding micturition habits, respiratory physiotherapy in | "Involuntary urinary loss"<br>104/176 (59%) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ND<br><br>March - September 1999 | | | No UI: 23.1 years | 65.5% | | the previous 12 months, and urinary symptoms. Completed in the presence of a clinician for any doubts. | Statistically significant difference: $p < 0.05$; age and FEV1 are positively correlated with the development of UI. |
| | | | Occasional UI: 24.8 years | 56.7% | | | |
| | | | Regular UI: 26.9 years | 53.5% | | | |
| Dicpinigaitis P.V. 2021<br><br>ND<br><br>March 2018 – September 2020 | 210F<br>Chronic cough | All women with chronic cough attending the referral center were included. | 61 years | NA | *<br><br>28 with UI<br>26 without UI | Data collection method was not specified. | Only SUI was considered: "involuntary loss of urine during or immediately following cough or other movement or activity"<br>133/210 (63.3%)<br>BMI statistically significant for the development of UI. |
| Hirayama F. 2008<br><br>ND<br><br>NR | 244M<br>Only COPD | Inclusion criteria: women aged at least 40 years with COPD as the primary pathology, diagnosed in the last 4 years. | #<br><br>UI: 68.9 anni<br>No UI: 66.3 anni | NA | #<br>UI: 22.1<br>No UI: 21.9 | ICIQ-SF<br><br>Administered during interview with referring clinician | 24/244 (10%) |
| Hrisanfow E. 2011<br><br>Descriptive questionnaire<br>November – December 2007 | 728<br>391F / 337M<br>Only COPD. | Inclusion criteria: age between 50 and 75 years, previous diagnosis of COPD confirmed by spirometry (stage I-IV).<br>Exclusion criteria: diagnosis of emphysema, chronic bronchitis, suspected asthma, suspected COPD. | #<br><br>F:<br>UI: 64.8 years<br>No UI: 65.2 years<br><br>M:<br>UI: 65.62 years<br>No UI: 66.57 years | NA | 25.6 F with UI<br>25.2 F without UI<br><br>28.2 M with UI<br>26.4 M without UI | Postal questionnaire. | "Involuntary urinary loss"<br><br>IC: 95%<br><br>194/391F (49.6%)<br>102/337M (30.3%)<br><br>Women with UI have a higher prevalence of symptomatic cough ($p<0.001$).<br>BMI is statistically significant for the development of UI in men and women. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hrisanfow E.<br>2012<br><br>Cross-sectional<br><br>November – December 2007 | 728<br>391F / 337M<br>Only COPD | Inclusion criteria: previous diagnosis of COPD confirmed by spirometry (stage I-IV).<br>Exclusion criteria: diagnosis of emphysema, chronic bronchitis, suspected asthma, suspected COPD. | #<br><br>F:<br>UI: 64.8 years<br>No UI: 65.2 years<br>M:<br>UI: 65.62 years<br>No UI: 66.57 years | NA | UI: 26.6F<br>No UI: 25.2F<br>*<br><br>UI: 28.2M<br>No UI: 26.4 M<br>* | Anonymous questionnaire composed of general data and UI assessment ("Do you involuntarily leak urine? Is it associated with coughing, sneezing, or exertion? Is it associated with a strong urge to urinate?")<br>Self administered. | "Involuntary urinary loss"<br>194/391F (49.6%)<br><br>Statistically significant difference in overall quality of life. ($p<0.01$).<br><br>102/337M (30.3%)<br><br>Statistically significant difference in the psychological burden of the primary pathology. ($p<0.05$).<br><br>BMI is statistically significant for the development of UI. |
| Hubeaux K.<br>2024<br><br>ND<br><br>November 2016 – September 2017 | 178<br>93M / 85F<br>Only CF | Inclusion criteria: patients >18 years, no previous lung transplants, not on the transplant list, stable for at least 4 weeks.<br>Exclusion criteria: dialysis, current pregnancy, renal lithiasis, and urinary tract infections. | 30.6 years<br>31.2 years M<br>30 years F | 63%<br>60.3% M<br>65.8% F | 21<br>21.3M<br>20.8F | USP for the evaluation of urinary symptoms.<br>SF-Qualiveen questionnaire for the impact on quality of life.<br>Not specified whether completed independently or in the presence of a clinician. | "Involuntary urinary loss"<br>Statistically significant difference ($p<0.05$):<br>female sex is positively correlated with the development of UI."<br><br>61/178 SUI (34.3%)<br>7/93M (7.5%)<br>54/85F (63.5%)<br><br>UUI<br>28/178 (15.7%)<br>4/93M (4.3%)<br>24/85F (28.2%) |
| Moran F.<br>2003<br><br>ND<br><br>NR | 46F<br>Only CF | All female patients attending the referral center were included. | 25 years | 25 patients >70%<br>17 patients 31-69%<br>4 patients <30% | NA | Questionnaire regarding severity and impact of physiotherapy treatment on UI and quality of life.<br>Self administered. | 14/46 (30.4%)<br><br>No statistical analysis was performed. |
| Nixon G.M.<br>2002<br><br>ND<br><br>December 2000 - March 2001 | 55F<br>Only CF | All female patients aged >12 years attending the referral center were included. | 15 years | #<br><br>UI: 82.4%<br>No UI: 78.3% | #<br><br>19.1 | Questionnaire regarding prevalence, severity, and impact of UI.<br>Administered by a clinician. | 25/55 (45%) of which 19 in the last year. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Orr A.<br>2001<br><br>ND<br><br>4 months | 75F<br>Only CF | All women from the referral center were included. | 6 unspecified age groups were present. | NA | NA | Anonymous questionnaire regarding severity, physical impact, and social impact of UI.<br><br>Self administered | 51/75 (68%)<br><br>It is present in all age groups without statistically significant difference. |
| Prasad S.A.<br>2006<br><br>ND<br><br>NR | 103F/0M | | 11-17 years<br># | # | * | Anonymous questionnaire regarding frequency, severity, and impact of incontinence.<br>Self administered. | CF 17/51 (33%)<br>ASTHMA 4/25 (16%)<br>CONTROLS 2/27 (7%)<br><br>Statistically significant difference (P=0.02) in UI prevalence between CF vs asthma and controls.<br>Within the CF group, lower BMI and FEV1 (16.6 and 62%) are statistically significantly correlated with the development of UI.<br>Lower BMI is a risk factor for the development of UI. |
| | CF: 51 | | 13.8 years | 74% | 17.8 | | |
| | Asthma: 25 | | 14.2 years | 80% | 22.4 | | |
| | Controls: 27 | Patients from the departments of general pediatrics, hematology, neurology, and urology were excluded. | 13.9 years | NA | 18.9 | | |
| Reichman G.<br>2015<br><br>ND<br><br>NR | 122<br>52F / 70M<br>Only CF | All patients from the referral center were included. | 8.4 years (mean age of children under 12 years)<br>25.6 years (mean age of patients over 12 years)<br>No UI: 17 years<br>UI: 27 years | NA | NA | Questionnaire regarding micturition habits, prevalence, frequency, and severity of UI, administered to parents in the group with age ≤12 years<br>Questionnaire regarding micturition habits, prevalence, frequency, severity, and impact of UI, administered to other patients, self-administered. | "Involuntary urinary loss"<br>33/122 (27%)<br><br>26/52F<br><br>(50% of total women,<br>0/14 girls ≤ 12 years old<br>54% feamale adolescents 12-17 years reported UI<br><br>76% of adult women reported UI)<br><br>7/70M (10% of total men)<br><br>UI is correlatedwith patient age. |
| Sacomori C.<br>2020<br><br>Cross-sectional | 93<br>72F / 21M | Patients with neurological pathology or illiteracy were excluded. | 62.6 years | NA | 84.9% of the sample is overweight or obese. | ICIQ-UI-SF<br><br>Self administerd. | 29/93 (31.2%)<br><br>8/31 COPD (25.8%) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| October 2015 – April 2016 | Asthma: 62<br><br>COPD: 31 | | | | | | 21/62 ASTHMA (33.9%)<br><br>Only F reported UI (29/72 = 40.3%)<br><br>No statistically significant difference was found between the two groups, but UI was associated with a lower quality of life ($p<0.05$). |
| Schnell K.<br>2012<br><br>Nationally representative study-design<br><br>1999-2008 | 15823<br>14828 healthy<br>(47%M, 53%F)<br>995 COPD<br>(39.9%M, 60.1%F) | | Patientsc ≥ 45 years<br>60 years healthy<br>62.7 years COPD | NA | NR | Home interviews and examinations in mobile units. | "Involuntary urinary loss at least twice a month"<br>27.3% healthy<br>34.9% COPD<br>Statistically significant difference ($p>0.0001$). |
| Vella M.<br>2009<br><br>ND<br><br>NR | 98F<br>Only CF | All women from the referral center were included. | 28 years (range 16-45 years) | NA | NA | King's Health Questionnaire<br><br>Self administered. | "Involuntary urinary loss"<br><br>73/98 (74%)<br><br>Age is a risk factor for the development of UI. |
| White D.<br>2000<br><br>Prospective study<br><br>NR | 71<br>29F / 42M<br>Only CF | All patients from the referral center were included. | 24.1F<br>25M | 16 ≤40%<br>26 41-70%<br>29 >70% | NA | Questionnaire regarding frequency, severity, and impact of SUI.<br>Completed through interview with a physiotherapist. | 11/29F (37.9%) (but 14/29 (48%) reported urinary leakage with cough)<br>1/42M (2.4%) |

Legend: BMI, body mass index; COPD, chronic obstructive pulmonary disease; CF, cystic fibrosis; F, females,; $FEV_1$, forced expiratory volume in 1 second; M, males; NA, not assessed; ND, not defined; NR, not reported; UI, urinary incontinence; SUI, stress urinary incontinence; UUI, urge urinary incontinence. #: not statistically significant difference; *: statistically significant difference.

**Supplementary Table 12. Risk of bias and quality of evidence of the reviewed studies according to the GRADE approach.**

| Item GRADE / Author and year | RISK OF BIAS | | | Quality of evidence |
|---|---|---|---|---|
| | **Failure to develop and apply an appropriate eligibility criterion: presence of a control group** | **Incorrect measurement of exposure and outcome.** | **Failure to properly control confounding factors.** | |
| Arismendi E. 2024 | Absence of a control group. | Unvalidated questionnaire. Self-administered. | Presence of LUTS not assessed. | Very low |
| Blackwell K. 2005 | Absence of a control group. Absence of exclusion criteria. | Unvalidated questionnaire but followed by an interview with a clinician. | BMI not assessed. Presence of LUTS not assessed. | Very low |
| Browne W.J. 2009 | | Unvalidated questionnaire. Self-administered. | Presence of LUTS not assessed. | Very low |
| Burge A.T. 2015 | | Urinary incontinence was measured in general, a higher incidence of stress incontinence is reported, but it is not analyzed. | Failure to exclude patients with neurological pathologies in the comparison group. | Very low |
| Burge A.T. 2016 | | | Failure to exclude patients with neurological pathologies in the comparison group. | Low |
| Button B.M. 2019 | | Different administration of questionnaires in the two examined groups. | Failure to exclude patients with neurological pathologies in the comparison group. | Very low |
| Cornacchia M. 2001 | Absence of a control group. Absence of exclusion criteria. | Unvalidated questionnaire but followed by an interview with a clinician. | Presence of LUTS not assessed. | Very low |
| Dicpinigaitis P.V. 2021 | Absence of a control group. Absence of exclusion criteria. | Data collection method not specified. | Failure to exclude patients with neurological pathologies. Presence of LUTS not assessed. | Very low |
| Hirayama F. 2008 | Absence of a control group. | | Failure to exclude patients with neurological pathologies. Presence of LUTS not assessed. Alcohol assessed as a risk factor. | Very low |
| Hrisanfow E. 2011 | | Unvalidated questionnaire. | Mancata esclusione di pazienti con Failure to exclude patients with neurological pathologies. | Very low |
| Hrisanfow E. 2012 | | Unvalidated questionnaire. | Failure to exclude patients with neurological pathologies. | Very low |

| | | | | |
|---|---|---|---|---|
| Hubeaux K.<br>2024 | Absence of a control group. | | Failure to exclude patients with neurological pathologies. | Very low |
| Korzeniewska-Eksterowicz A.<br>2014 | Absence of a control group.<br>Absence of exclusion criteria. | Unvalidated questionnaire. | Failure to exclude patients with neurological pathologies.<br>Presence of LUTS not assessed. | Very low |
| Mariani A.<br>2021 | Absence of a control group. | | | Low |
| Moran F.<br>2003 | Absence of a control group.<br>Absence of exclusion criteria. | Unvalidated questionnaire. | Failure to exclude patients with neurological pathologies.<br>Presence of LUTS not assessed.<br>BMI not assessed. | Very low |
| Nixon G.M.<br>2002 | Absence of a control group.<br>Absence of exclusion criteria. | Unvalidated questionnaire but administered by a clinician. | Failure to exclude patients with neurological pathologies.<br>Presence of LUTS not assessed.<br>Constipation considered as a risk factor for urinary incontinence. | Very low |
| Orr A.<br>2001 | Absence of a control group.<br>Absence of exclusion criteria. | Unvalidated questionnaire. | Failure to exclude patients with neurological pathologies.<br>Presence of LUTS not assessed.<br>BMI not assessed. | Very low |
| Prasad S.A.<br>2006 | Absence of exclusion criteria. | Unvalidated questionnaire. | | Low |
| Reichman G.<br>2015 | Absence of a control group.<br>Absence of exclusion criteria. | | BMI not assessed. | Very low |
| Sacomori C.<br>2020 | | | Presence of LUTS not assessed. | Low |
| Schnell K.<br>2012 | | Investigated areas not specified. | Stroke was included among comorbidities with high prevalence (8.9%), but there is no distinction in UI (patients with and without stroke), therefore the prevalence data may be altered. | Very low |
| Vella M.<br>2009 | Absence of a control group.<br>Absence of exclusion criteria. | | Failure to exclude patients with neurological pathologies.<br>BMI not assessed. | Very low |
| White D.<br>2000 | Absence of a control group.<br>Absence of exclusion criteria. | | Failure to exclude patients with neurological pathologies.<br>Presence of LUTS not assessed.<br>BMI not assessed.<br>Childbirth and surgery considered. | Very low |

## Supplementary Table 13. Application of the STROBE checklist to the studies included in the review.

| Item STROBE / Article | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arismendi E. 2024 | YES | YES | YES | YES | YES | YES | YES | NO | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | 20/22 |
| Blackwell K. 2005 | YES | YES | YES | NO | YES | NO | YES | NO | NO | YES | YES | YES | YES | YES | YES | YES | NO | YES | NO | YES | YES | NO | 15/22 |
| Browne W.J. 2009 | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | 21/22 |
| Burge A.T. 2015 | YES | YES | YES | YES | YES | YES | YES | YES | NO | NO | YES | YES | NO | NO | NO | YES | YES | YES | NO | YES | YES | NO | 15/22 |
| Burge A.T. 2016 | YES | YES | YES | NO | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | 19/22 |
| Button B.M. 2019 | YES | YES | YES | YES | YES | YES | YES | YES | NO | NO | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | 19/22 |
| Cornacchia M. 2001 | YES | YES | YES | NO | YES | NO | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | NO | 17/22 |
| Dicpinigaitis P.V. 2021 | YES | YES | NO | NO | YES | NO | YES | YES | NO | NO | YES | YES | NO | YES | YES | YES | YES | YES | NO | YES | YES | NO | 14/22 |
| Hirayama F. 2008 | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | NO | YES | YES | YES | YES | NO | 18/22 |
| Hrisanfow E. 2011 | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | 20/22 |
| Hrisanfow E. 2012 | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | 20/22 |
| Hubeaux K. 2024 | YES | YES | YES | YES | YES | YES | YES | YES | NO | NO | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | 19/22 |
| Korzeniewska-Eksterowicz A. 2014 | YES | YES | YES | NO | YES | NO | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES | 18/22 |
| Mariani A. 2021 | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | NO | 19/22 |
| Moran F. 2003 | YES | YES | YES | YES | YES | NO | YES | YES | NO | YES | NO | NO | YES | YES | YES | NO | YES | YES | NO | YES | YES | NO | 15/22 |
| Nixon G.M. 2002 | YES | YES | YES | NO | YES | NO | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | 18/22 |
| Orr A. 2001 | YES | YES | YES | NO | YES | NO | YES | YES | NO | NO | NO | NO | NO | NO | YES | YES | NO | YES | NO | YES | YES | YES | 12/22 |
| Prasad S.A. 2006 | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | NO | YES | NO | YES | YES | NO | 18/22 |
| Reichman G. 2015 | YES | YES | YES | NO | NO | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | 18/22 |
| Sacomori C. 2020 | YES | YES | YES | YES | YES | YES | YES | YES | NO | NO | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | 19/22 |
| Schnell K. 2012 | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | 22/22 |
| Vella M. 2009 | YES | YES | YES | NO | YES | NO | YES | YES | YES | NO | YES | YES | NO | YES | YES | YES | NO | YES | YES | YES | YES | NO | 16/22 |
| White D. 2000 | YES | YES | YES | YES | YES | NO | YES | YES | NO | NO | YES | YES | NO | YES | YES | YES | YES | YES | NO | YES | YES | NO | 16/22 |
| TOT | 22/22 | 22/22 | 21/22 | 11/22 | 21/22 | 13/22 | 22/22 | 21/22 | 4/22 | 14/22 | 20/22 | 19/22 | 14/22 | 20/22 | 21/22 | 21/22 | 16/22 | 22/22 | 12/22 | 22/22 | 22/22 | 8/22 | |

Legend: 1. Title and abstract; 2. Rationale; 3. Objectives; 4. Study design; 5. Setting; 6. Participants; 7. Variables; 8. Data source and measurement; 9. Bias; 10. Sample size; 11. Quantitative variables; 12. Statistical methods; 13. Participants; 14. Descriptive data; 15. Outcome data; 16. Main results; 17. Other analyses; 18. Key results; 19. Limitations; 20. Interpretation; 21. Generalizability; 22. Funding.