

Mixed Urinary Incontinence (MUI) in Women: From Evidence to Clinical Practice

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Abstract

Mixed Urinary Incontinence (MUI) in women is an important disease that is under-treated and under-reported with high prevalence of 33% of all cases of incontinence. It significantly impairs women's quality of life. MUI usually represent with more severe symptoms and are more likely to present for the treatment as per the recent studies. The management not only includes the conventional but also the complementary and alternative medicine treatment incorporating details from evidence to clinical practice. Combinations of behavioral modification, pelvic floor physiotherapy, biofeedback, pharmacotherapy, anti-incontinence devices, and complementary therapies is useful to treat mixed symptoms. Some researches recommended the use of Serotonin/Norepinephrine Reuptake Inhibitors (SNRIs) and antimuscarinic drugs to treat MUI. Some studies showed that acupuncture is beneficial for MUI. The treatment with herbal medicine such as mace, *Boswellia serrata* and *Cyperius* were also effective in treating MUI symptoms.

Keywords: Antimuscarinic Drugs, Complementary and Alternative Medicine, Mixed Urinary Incontinence, Pelvic Floor Physiotherapy, "Quality of life"

1. Introduction

"Urinary incontinence is defined by International Continence Society (ICS) as involuntary leakage of urine"¹. It is "a symptom^{1,2}, sign, as well as a condition"³. It results from either a bladder or sphincter disorder². Although urine leak occurs from the urethra, it may also occur from extra urethral sources such as congenital malformations or fistulas of the lower urinary tract³. Urinary Incontinence (UI) is classified into Stress Urinary Incontinence (SUI), Urgency Urinary Incontinence (UUI), or Mixed Urinary Incontinence (MUI)^{1,2}. The prevalence of incontinence is more in women than men². MUI occurs due to sphincter failure and over activity of the bladder detrusor muscle⁴. UI is more and more seen in the clinics

as it has high prevalence in middle-aged (20% to 30%) and elderly women (30% to 50%)⁵. In the United States, the total annual cost of UI is about US\$19.5 billion⁴. MUI is a concurrence of stress (SUI) and urge (UUI) incontinence^{4,6,7} affecting approximately 33% of women⁷. Incontinence word is derived from the Latin word "incontinentia" meaning "greediness" and incontinence is "inability to contain"⁸.

1.1 Definition

"Urinary incontinence is defined by the International Continence Society (ICS) as involuntary loss of urine". SUI is an "involuntary loss of urine by effort, exercise, sneeze or a cough". Urge incontinence is the "involuntary loss of urine

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accompanied by or following a sudden compelling desire to void which is difficult to defer". MUI includes both "the involuntary loss of urine on urgency and loss of urine by effort, exercise, sneeze and a cough"^{1-3,9,10}.

For clinical outcomes of MUI, usually there is no established definitions. Hence, it remains a bothersome problem for patients as well as incontinence specialists^{11,12}. "Clinical MUI is based only on clinical evaluation and urodynamic MUI. Urge predominant MUI or stress predominant MUI was initiated to support practical use and orient treatment"¹¹. Depending on the method of evaluation, the incontinence subtype "predominance" varies and predominance is assessed by subjective measures (degree of bother and quality of life impact) or by objective measures (the frequency of incontinence episodes and urodynamic testing). A study explored "various definitions of MUI using validated research instruments in women with urge predominant MUI". They found that the prevalence of MUI between 72% and 96% by using the "Medical, Epidemiological, and Social Aspects of Aging (MESA) questionnaire". However, the prevalence of MUI varied from 64% to 78% by using the *Urogenital Distress Inventory (UDI) questionnaire*. Another study found comparable variation in rates of MUI described for women seeking surgical intervention for stress incontinence. These rates of MUI varied from 50.4% to 93.3% using similar MESA and UDI based definitions¹³. Until a standard operational definition is available, the authors recommend that "researchers characterize subjects with MUI using distinct descriptions of both urge and stress subcomponents"¹². The *National Health and Nutrition Examination Survey* study had assessed the prevalence of UI based on severity and showed that the overall prevalence was approximately 15%. However, only 8% of the population showed "severe" (more than once per week) MUI, if the definition is considered and exemplifying the importance of "definition" in the identification of MUI¹².

"Urodynamic MUI is represented by stress incontinence and detrusor overactivity (DO/OAB) with or without incontinence, on performing a urodynamic evaluation". The two major groups are urodynamic SUI and DO with incontinence (OAB wet) or without incontinence (OAB dry)^{6,9,10,14}.

In conclusion, if incontinence is objectively shown then the term "mixed incontinence", is clinically useful and if incontinence is subjectively reported by patients the term "mixed symptoms of incontinence" is clinically useful¹¹.

2. Epidemiology of Mixed Urinary Incontinence

2.1 Prevalence

UI is a general problem and affects up to 2/3rd women. However, its prevalence is simply underrated as patients in the clinics usually not able to convey the problem to the treating physician. Furthermore, only 1 in 4 symptomatic UI women approaches to the physician⁴. UI subtypes prevalence varies depending upon age, ethnicity, history taken, and definition of subtype¹¹. SUI is most frequently seen in females from 25 to 49 year of age. MUI is commoner in middle-aged women (40 to 60 years old) compared to urge-incontinence, which is mostly seen in elderly women¹⁵. Other prevalence factors for UI are gender, race¹⁰, parity, and obesity menopause¹⁶.

MUI prevalence rates differ broadly as per literature. The studies showed a variation of rates from 34% to as low as 9% in community-dwelling women⁴. In another study, the prevalence of MUI in women with incontinent was between 29% and 61%¹⁷.

A Norwegian study, the prevalence of UI was 25%, with 36% MUI. Another study reported 14.5% an overall prevalence of MUI in women. Further, in the same study, 57%, 36% and 37% reported severe MUI, stress (SUI) and urge (UUI) incontinence respectively¹¹. A study found that depending on the questions used and severity selected, 50% to 93% had prevalence of UI however, only 8% showed MUI on urodynamics. The majority of women in studied population, regardless of subjective measure used, were classified as having MUI¹³. Epidemiologic studies showed varied prevalence rate such as 34% in the NOBLE study and as low as 9% in the EPINCONT survey. Lemak *et al.*, identified a MUI prevalence of 26%¹³.

Shaw *et al.*, found that among 3,273 respondents, 21% reported SUI only, 3.5% reported UUI and 21% reported MUI, SUI and UUI during the preceding month (9% had moderate or severe symptoms). However, 53% of these women had not consulted any health care professional⁷. A survey of USA women showed 45% prevalence of UI of any kind or any type and 50% MUI symptoms incontinent¹¹.

Among incontinence, women estimates are that 50% suffer from SUI. Weekly incontinence was reported in > 28% of women including stress (37%), UUI (31%) and MUI (21%)¹⁸.

2.2 Risk Factors

Multiple factors have been found to be associated with UI and MUI.

2.3 Age

Hunskar et al., reported 17000 respondents (among 30,000 women in the household, via mailed questionnaire) had a high prevalence of incontinence that increases with age⁷. The type of incontinence may differ by age. Middle-aged women (40–60 y) more commonly reported UI. “*The NOBLE survey estimated that 5.2 million adults aged >18 years had mixed incontinence*”¹¹. UI is common in 25% of reproductive age women and 50% of postmenopausal women reporting at least weekly incontinence¹⁸. UI prevalence in 15 to 64 year females ranges from 10% to 55% and in about 38% of elderly females’ urinary leakage is severe to classify as a “*urinary incontinence problem*” within this group¹⁵.

2.4 Sex and menopause

UI is more common in women than men, the incidence is two times higher in women. Depending on the population confirmed and the definition used for incontinence the incidence of UI in men was between 3% and 11% whereas in females it ranges between 10% and 58%². The causes are hormonal changes, anatomic reasons, during pregnancy, and post pregnancy, weaken the pelvic muscles. Ortiz (2004) reported that 1 in 4 women have an episode of urinary incontinence and depends on the features such as age, the incidence of chronic diseases, professional activity, and menopause in the selected population. The greatest incidence of UI in women usually seen years perimenopausal or postmenopausal, reaching its maximum peak at 45 to 49 year¹⁵.

“*High-affinity estrogen receptors have been identified in the urethra, pubococcygeal muscle, and bladder trigone but are uncommonly found elsewhere in the bladder*”. Collectively, a hypoestrogenic-related collagen change, a decrease in urethral vascularity and volume of skeletal muscle contributes to the weakening of urethral function via decreased resting urethral pressure. In spite of the existing evidence that estrogen plays a role in normal urinary function, strong evidence whether estrogen therapy is of use to treat or prevent incontinence following menopause is less clear³.

2.5 Race

Authors in their results stated the highest proportion of black women showed UUI whereas white women and Latinas usually reported SUI. Traditionally, Caucasian women have higher rates of UI than other races. In contrast UUI is believed to be more prevalent among African-American women³. The reason for racial difference in the prevalence of UI is differences in the bulk of urethral muscle in different races. A low prevalence of SUI was found in Afro-Carribeans who are considered to have better urethral sphincter ability, as confirmed by a higher urethral closure pressures at rest and during pelvic contraction and also higher density of urethral striated muscle fibres. Further, a larger levator ani cross-sectional area and muscle strength is noted in women of Afro-Carribean descent¹⁰.

2.6 Cost

The \$19.5 billion cost (direct or indirect) of incontinence in the United States was predicted, astonishingly huge in comparison with the costs for various other chronic diseases. More than 1.1 million office visits for the primary complaint of incontinence in 2000 was anticipated¹⁴. Furthermore, in the USA, UI accounts’ for more than \$20 billion in annual expenditures, the amount greater than the annual direct costs of breast, and female genital cancers combined¹⁸.

2.7 Obesity

Researches have revealed that obesity is an independent and strong risk factor for UI¹⁹. There may be possibly a stronger relationship between increasing weigh, and prevalent and incident of SUI, MUI than for UUI and OBS. Though, the mechanism of the association between UI and obesity is not clear³. Studies have proven that a weight loss of 8% in obese women showed a decrease in overall UI per week and UUI episodes by 47% and 42% vs 28% and 26% in controls, respectively. A study in women with UUI found 80.7%, 68.5% and 39.4% reduction in UI episodes with behavioral therapy, oxybutynin and placebo treatment respectively, showing behavioral therapy is more effective in UI. UI episodes were reduced with small reduction in weight loss. In a study of 40 women, a 5%–10% weight reduction decreased weekly incontinence episodes by 54%¹.

In morbid, level 2 evidence and moderately obese patients, level 1 evidence showed benefits of weight loss. In a randomized controlled trial, after 6 months showed that *“women in the weight-loss program had considerably fewer incontinence episodes because of significant weight loss than those in the behavior modification or to a structured education group”*¹¹.

2.8 Parity

Pregnancy, vaginal delivery and menopause have key consequences for UI. The major risk reasons considered for the development of urinary incontinence were pregnancy and childbirth. It appears that the UI prevalence increases during pregnancy and decreases following delivery, though postpartum prevalence still remains higher than before pregnancy¹⁰. One study adds to the current epidemiologic evidence that there is a strong relationship between UI and vaginal childbirth. Further, the authors suggested that the process of childbirth itself as well as processes during pregnancy are strongly related to UI²⁰.

Another study found a strong association between the prevalence of UI and parity. They noted that UI prevalence was high in parous women aged 30-44 years of age, and 45 years and more, with three or more childbirths, it increased with increasing parity. UI related to parity may be based on child birth causing perineal muscular or neuromuscular dysfunction. It was found that following vaginal delivery UI was caused by injury not to the pelvic floor muscles themselves but to their innervations; most evident in multiparous women and in those who had experienced a prolonged second stage of labour or a forceps delivery^{3,21}. Another study also found parity was linked with UI²².

2.9 Recurrent urinary tract infection

Recurrent UTI is independently related to UUI and MUI²³.

2.10 Smoking and Chronic Lung Disease and Other Habits

It may be independently associated with UI. UUI was associated with high caffeine intake²³. A noteworthy rise in the risk of UI in women older than 60 years with Chronic Obstructive Pulmonary Disease (COPD) was demonstrated in two epidemiologic studies. Likewise, several studies observed that cigarette smoking is also an independent risk factor for UI. In one of these studies,

both current and former smokers compared with non-smokers were observed to have a 2-3 times higher risk of UI. A smoker's chronic cough causes persistently increased intra-abdominal pressures and collagen synthesis is reduced by the anti-estrogenic effect of smoking³ that leads to UI.

Holmgren et al. found that age, body mass index, cesarean section, local estrogen, radiation, gynecologic malignancy and history of chronic constipation were different in patients with MUI as compared with those with USI⁷. Endocrine disorders (diabetes), smoking, central or peripheral neuropathies, dementia and medication such as diuretics are risk factors for UI¹⁰.

2.11 Depression

In a large population, the study found that women with severe UI aged from 50 to 69 had 80% greater likelihood of presenting with deep depression whereas women with mild to moderate incontinence had 40% chance of presenting with depression. Patients with UUI or MUI may have higher possibility to develop a psychological disorder. In a mail study, the incidence of depression in women was comparable to the degree of social isolation and quality of life and to the degree of UI. Women with severe UI have a 4 times higher incidence of a stress disorder. Current guidelines suggest that women with medium and severe UI needs to be screened for coexisting depression and to be treated according².

3. Pathophysiology

“Normal continence in women is a complex coordination of bladder, urethra and pelvic muscles as well as surrounding connective tissues”^{9,11}. Continence requires effective lower urinary tract functioning; dexterity, cognition adequate mobility, and motivation to be continent; and absence of environmental and iatrogenic barriers²⁴. Disorder in storage and emptying leads to MUI. In individuals, urethral sphincter dysfunction as well as bladder dysfunction may co-occur and fitting the patient into one specific category might compromise clinical care¹¹.

The normal urethral function depends on both intrinsic and extrinsic factor. The intrinsic factors are smooth-muscle function and normal urethral mucosal that are linked to tissue and genetic factors, estrogen status, any prior urethral disease or manipulation that probably have disturbed the normal urethral epithelium

and tissue conformity. The basic extrinsic factors are “static pubourethral ligamentous support and the dynamic function of the striated muscle of the pelvic floor”. The integral theory of female UI was introduced by Petros and Ulmsten in 1990. This theory explains both SUI and MUI i.e., activation of stretch receptors in the bladder and proximal urethra because of laxity of the anterior vaginal wall leads to the indulgence of urethral closure pressure and incorrectly trigger micturition reflex. This is the dominant therapeutic model at present⁴. However, theories regarding the pathogenesis of SUI must be recognized as hypotheses and not necessarily as established facts⁶.

One risk factor or one concept is inadequate to elucidate the complexity of MUI. Consequently, the “trampoline theory” tries to include all the factors that may lead to MUI¹¹.

4. Evaluation of MUI

Effective history-taking¹⁸ is the basis of assessment and lets the physician to make a clinical diagnosis and evaluate the severity and duration of the UI⁶. Further, it helps to exclude other conditions that can mimic incontinence such as UTIs, bladder cancers and calculi and to assess for risk factors predisposing to incontinence²⁵. Patients should be asked about the Lower Urinary Tract Symptoms (LUTS), and bladder diaries can provide essential supportive information⁹. The risk factors such as smoking, obesity, etc., and another medical history should be evaluated thoroughly⁶. To identify types of UI, ask about triggers to UI including physical exercise, coughing, sneezing, lifting (SUI); or hearing running water, hand washing, sudden severe need to void (UUI) urgency without loss of urine (OB-dry), amount of urine loss. Standardized incontinence pad weight tests are a more objective measure of urine loss²⁵.

The diagnosis of MUI should preferably rely on a symptom and urodynamic evaluation due to the unpredictable association between urodynamic- and symptom-based diagnoses¹³. Gender has a noteworthy impact on the level of bother experienced by patients and the relative importance of urinary symptoms. In women, storage symptoms are predominant with bother increasing with increasing UI. In men, voiding symptoms predominate with SUI and MUI is present only in a few proportion cases⁹.

Epidemiologic studies showed that MUI usually have more severe symptoms and tend more bothersome than

pure SUI or pure UUI. Consequently, MUI women take treatment¹⁷. Mixed symptoms of UI are very common, occurring in between 29% and 61% of cases. In a study sample of 950 consecutive incontinent women at Duke University, 52% presented with mixed symptoms, while only 14% had mixed conditions, i.e. both USI and DO confirm on urodynamic studies⁷.

4.1 Quality of life (QoL)

UI affects the QoL. It is considered that a lack of health generates feelings of anger, embarrassment, sadness and depression. Further, women with UI lose self-confidence and avoid social gatherings which have a relative impact on their sexual life, emotional health, and their social interactions. A study in Baltimore, 5,024 patients with an OAB with or without incontinence showed clinically significant impact on the QoL, on the quality of sleep and psychological health, both genders. The physical, psychological and social incidences affect the quality of life².

In an Austrian study, 65.7% of the women believed that the disorder was detrimental to their quality of life. Further, this detriment was interrelated with the degree and the incidence and the number of pads and other urine collection devices².

4.2 Physical Activity

SUI is more common in a physically active female (practice sports and/or exercise regularly)¹⁵.

In a clinical study, more than 60% women with medium to severe UI symptoms reported restriction in their activities and physical exercises. Brown et al., found that athletic activities were avoided by more than 33.3% of women between the ages of 45 and 50 and feared an incontinence episode during exercise².

A study found that women with severe UI in comparison to continent women have 2.64 times higher likelihood not to exercise. Further, women with severe UI (85.3%) believed their problem was the main barrier to physical exercise, compared to the average UI of women (64.5%). Avoidance of physical exercise apart from psychosocial parameter also increases the risk of osteoporosis, hypertension, and coronary heart disease².

4.3 Sexual Dysfunction

A study found that patients who reported UI also reported sexual dysfunction in 30.5% as a consequence of loss of

urine. One more study proved that both SUI and UUI, drastically reduced sexual function. Further, patients reported “*lower scores of desire, stimulation, lubrication of the vagina, orgasm and satisfaction, but not in pain*”. A study established 46% of 216 women, who were diagnosed with UI exhibited sexual dysfunction. Of these women, 34%, 23%, and 11% reported the loss of sexual desire, difficulty in sexual stimulation and orgasm respectively. Among sexually active women, the possibility of sexual dysfunction was related to the degree of incontinence².

5. Clinical Examination and Investigation

A clinical examination is a necessary part of the evaluation⁶. Clinical examination should include complete examination of the patient including bladder palpation. Pelvic and rectal examination should be performed in women⁹. The vulva and perineum are examined for inflammation (“diaper rash”) and generalized erythema on the perineal skin caused by chronic urine contact. Vaginitis and infectious or atrophic urethritis possibly may cause irritation, frequency, urgency, or incontinence⁶.

Bivalve speculum examination for a vaginal examination is performed to assess urethral hypermobility and Pelvic Organ Prolapse (POP) with halfway system of the POPQ system. A rectal examination can be used to detect sphincter tone and control. Anal incontinence (gas, liquid stool, or solid stool) occurs in up to 20% of patients with urinary incontinence⁶. Bonny test and Q-tip test are used to assess the mobility of urethra⁶.

5.1 Bladder Diary

The most excellent probable, reliable and reproducible means of achieving is bladder diary self-recorded by the patient for 1 to 7 days⁶. One of the voiding diary is Questionnaire Voiding Dairy (QVD)²⁶.

5.2 Pad Test

Though pad test cannot be used to distinguish between SUI and UUI but it gives additional objective information in combination with a voiding dairy with reference to the severity of the patient’s urinary incontinence. There are various available methods to perform a valid pad test that vary from hours to days⁶.

5.3 Cough Stress Test

The cough stress test is also known as a stress test or provocative stress test. The cough stress test is performed with full (symptomatic fullness) and empty bladder (supine empty stress test/SEST). In this test, the patient is advised to relax and cough forcefully while urine loss from the urethra is noted. Usually, the patient is educated to void first before the pelvic examination and in the lithotomy position, the patient is asked to cough or perform a Valsalva maneuver. If the patient loses urine, it means she has a positive SEST. However, the cough stress test is not that useful in excluding women with MUI or ISD on urodynamic evaluation⁶.

5.4 Urinalysis

Urinalysis is helpful to rule out bacteriuria, pyuria, haematuria, glucosuria, and proteinuria⁹.

5.5 Voiding Cystourethrography (VCUG)

Pelsang *et al.*, noted that the VCUG in showed 56% sensitivity and 74% specificity to predict SUI. Further authors concluded that anatomic measurements of the posterior urethrovesical angle change, urethral inclination and urethral descent have partial ability in envisaging stress incontinence⁶.

5.6 Urodynamic Study

Urodynamics testing include simple urodynamic urodynamics (filling cystometry and Q tip test) and complex urodynamics [multichannel cystometry, pressure flow voiding studies, urethrocystoscopy, Urethral pressure profile and Stress Leak Point Pressure (SLPP)].

Urodynamic study is performed to define the functional status of the lower urinary tract and includes testing muscle activity and hydrodynamics. Further, urodynamic study gives objective documentation of urine leakage and reproduction of patient symptoms in UI. Cystometry and uroflowmetry are the basic test used to assess the filling-storage phase and voiding phase in the urodynamic testing respectively. However, complex urodynamics tests provide supplementary information.

For precise measurement of increased intravesical pressure, multichannel cystometry is useful.

Urine leakage with a sudden increase in intra-abdominal pressure is observed in genuine SUI patient without detrusor contraction, whereas in UUI patient spontaneous or provoked detrusor contraction is

associated with UI. A combination of both cystometric findings is exhibited in patients with MUI. Nevertheless, remember that presently available tests as well as the multichannel urodynamics do not fulfil the fundamental requirements of accurate predictive value, standardization, and reproducibility with respect to therapeutic outcome. A study concluded that in most of the UI women, urodynamic evaluation is unnecessary in general practice⁶.

Hence, history and clinical examination are the important basic clinical aspects in the differential diagnosis of UI. The key to diagnostic and clinical success in the female patient for UI is a comprehensive investigation of multiple dimensions of UI, using subjective as well as objective testing.

Simple urodynamic tests (Level II)

- Filling cystometry
- Q tip test

Complex urodynamic Test (Level III)

- Multichannel cystometry
- Pressure flow voiding studies
- Urethrocystoscopy
- Urethral pressure profile
- Stress leak point pressure (SLPP)

6. Complications of Urinary Incontinence

UI is associated with several complications such as skin problems, urinary retention, vesicoureteral reflux and chronic and recurrent Urinary Tract Infections (UTI). In skin problems, UI causes constant wet skin which leads to rashes, sores and skin infections. UI increases the risk of recurrent UTI. In addition, UI also affects the Health-related quality of life which adversely affects social, personal and professional life⁴.

7. Urinary Incontinence Severity and Health-related Quality of Life Questionnaire Useful in Urinary Incontinence

Several tools have been planned to assess condition-specific measures, HRQoL and satisfaction scales. The important tools for diagnosing UI and QoL are *Medical, Epidemiologic and Social Aspects of Aging* (MESA)

questionnaire, *I-QOL (The incontinence quality of life questionnaire)*, *KHQ (The king's health questionnaire)*, *3IQ (The 3 Incontinence Questions Questionnaire)*, *QUID (The Questionnaire for Female Urinary Incontinence Diagnosis)*, *Short form of Urogenital Distress Inventory Questionnaire-6 (UDI-6)*, *Short form of Incontinence Impact Questionnaire-7 (IIQ-7)*, *Short form of the Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12)*, *Patient Global Impression Index of Improvement (PGI-I) instrument*, *Patient Global Impression Index of Severity (PGI-S)* and satisfaction with treatment outcome measured on a 5-point Likert scale (very dissatisfied to very satisfied) are use in UI^{13, 26, 27}. Incontinence Severity Index (ISI) consists of two items, one with 4 response levels for frequency and the other with three response levels for the amount of leakage. The severity index is produced by multiplying the results of questions 1 and 2. The resulting index values (1–12) are further categorized into four levels. [[1–2 = slight; 3–6 = moderate; 8–9 = severe; and 12 = very severe]. The correlation coefficient was 0.54 ($P < 0.01$)²⁸. The PGI-I response correlates significantly with the cough-test results, pad-test results, frequency of incontinence episodes, and scores on Several Incontinence Quality of Life questionnaires²⁹. PGI-S Questionnaire is used to evaluate changes in the perceived severity of incontinence on a 4-point Likert scale [Labrie]¹⁷.

8. King's Health Questionnaire (KHQ)

European Clinical Practice Guidelines recommends KHQ and it is a reliable and valid instrument for the evaluation of the HRQoL. It is widely used questionnaire as it is simple and consumes less time to administer, (on average 5 minutes), easy to understand by either gender, and it also covers several domains of life age. It covers various bladder conditions (SUI, MUI, and OAB). Improvement in HRQoL is indicated by decreases in KHQ domain scores³⁰. KHQ's internal consistency was good enough with a Cronbach's α of 0.721–0.915.

9. Incontinence Quality of life Questionnaire [I-QOL]

I-QOL contains 22 items. A total score and three subscales score each response with a five-point Likert-type response scale. "These 22 items are summed and then transformed to a 0 to 100 scale for greater interpretability, with higher

scores representing higher QOL³¹. The I-QOL is the best instrument and in a clinical trial setting, it is continence-specific measure of the quality of life. Further authors concluded that SSI and EQ-5D are not recommended³².

10. ICIQ-SF Questionnaire

The International Consultation on Incontinence Questionnaire—Short Form (ICIQ-SF) is a subjective measure for assessing the severity of urinary loss and condition-specific quality of life³³. The ICIQ-SF scores between 0 and 21, 21 being the worst possible incontinence. The Intra-class correlation coefficient was 0.80 for the final ICIQ-SF score and the intra-class correlation coefficient was 0.84³⁴. The high validity, reproducibility and sensitiveness of the questionnaire is proven (Grade - A).

A high internal consistency was shown for IIQ and UDI instruments and test-retest reliability (Spearman's rho was 0.99 for both of the scales ($P < 0.001$). *"The average, which ranges from 0 to 3, is multiplied by 33 1/3 to put scores on a scale of 0 to 100"*³⁵.

11. PISQ-12 Questionnaire

The PISQ-12 is a short-form of the PISQ-31 measure. It is a self-administered questionnaire and evaluates sexual function experience with UI and/or POP in heterosexual women³⁶. ***The authors evaluated thirteen questionnaires in their review and found that three were "outperform" the remainder in terms of their psychometric properties. ICIQ, I-QOL, and KHQ were strongly recommended to assess women with UI. The 3IQ and QUID are good instruments for the diagnosis of MUI based on the patients' symptoms³⁷. Bradley et al., (2010) studied QUID validity and responsiveness in 444 women with SUI and MUI and concluded that QUID is satisfactory psychometric characteristics and useful as UI outcome measure in clinical trials.*** The QUID is a useful questionnaire to identify the presence and frequency of SUI and UUI symptoms. Three items focus on SUI symptoms and three for UUI symptoms. QUID scores identify UI type accurately in 80% of participants³⁸.

12. Management

MUI is a troublesome condition for patients and incontinence specialists because for treatment to be successful, both the stress and urge components of the

incontinence need to respond to the therapies¹³. Typically, clinicians treat the component of MUI which is most symptomatic, most bothersome, and most readily treated. Thus, while women with predominant stress incontinence undergo surgical treatment, those with predominant urge incontinence are treated with medicine and pelvic floor muscle therapy. However, the optimal treatment for women who experience significant and bothersome symptoms of both stress and urge incontinence is not known. Without clear clinical guidelines for clinicians, such women with MUI are subject to a wide variety of treatment approaches without any scientific evidence¹⁷.

13. Conservative Management

Conservative management has been considered the basis of primary care treatment in women with MUI and can be initiated after simple evaluation. It includes lifestyle interventions, bladder retraining, anti-incontinence devices, biofeedback, complementary therapies and Pelvic Floor Muscle Exercises (PFME)¹¹. Nevertheless, for healthy non-neurogenic patients with significant bothersome symptoms, first-line therapies include dietary and lifestyle modifications—primary care providers can typically implement these initially. For example, patients should limit their fluid intake, especially caffeinated and/or carbonated beverages such as colas, coffees, teas, and citrus drinks. Bladder and bowel habits should also be addressed. Patients should be taught bladder training and delayed voiding, as well as timed voiding. Constipation should be actively managed and avoided when possible as it has been consistently shown to contribute to lower urinary tract dysfunction¹.

Grade A evidence recommendation supports the use of PFME in women with MUI as the overall cure/improvement rates ranged from 56 to 70%¹¹.

14. Pharmacotherapy

The first-line drugs that help both conditions [SUI and UI] with treatment focuses on the pathophysiology of major symptoms. The drug approaches include drugs targeting SUI or UUI, Hormone Replacement Therapy (HRT), and drugs acting on both SUI and UUI.

A contradictory data is available for the efficacy of topical and systemic estrogens in the treatment of SUI and MUI. The Cochrane review of 15 RCT studies observed that UI improved with HRT, however, increase in the risk

of incontinence was observed to be increased by oral or transdermal estrogen. However, grade D recommendation has been given for the use of estrogen in the treatment of UI by The International Consultation on Incontinence.

Few studies suggested that Serotonin/Norepinephrine Reuptake Inhibitors (SNRIs) and antimuscarinic drugs had a positive effect on MUI. Though no vigorous data support the usefulness of Imipramine in MUI, it was recommended as it has a dual action of anticholinergic and SNRIs. It can be of use in young and elderly women who are not candidates for surgery though it has low morbidity and variable success. A grade D recommendation was received imipramine to treat SUI. A study in women with MUI, median MUI episodes were reduced by 62% and 63% at 40 mg/daily and 80 mg/daily respectively with the use of duloxetine. Bent and colleagues in a double-blind, randomized, placebo-controlled clinical trial in women with MUI who received 80 mg daily duloxetine or placebo were studied. They reported that overall, episodes of frequency, SUI and UI were considerably lesser with duloxetine. Likewise, another study reported that elderly women with stress predominant MUI responded to duloxetine. The clinical studies support the use of antimuscarinic agents (tolterodine, oxybutynin, solifenacin and fesoterodine) in MUI and overactive bladder (OAB). Kreder et al., compared the efficacy of tolterodine twice daily in patients with urge-predominant MUI and patients with UI alone, reporting no significant between-group differences. In the Mixed Incontinence Effectiveness Research: Investigating Tolterodine (MERIT) study reported that 4 mg extended-release tolterodine was useful in the patient with urge predominant MUI. In a prospective, randomized study with solifenacin (5–10 mg), 1041/2696 women (39%) with urgency predominant MUI achieved median reductions in incontinence episodes of 82% (5 mg) and 94% (10 mg) vs 64% placebo¹¹.

15. Surgery

Since surgery is used mainly to treat SUI, primary physicians, urologists and gynecologists should include the option of surgery during treatment counselling for women with predominant SUI. The best approach has not yet been defined. Surgical treatment of MUI includes retropubic colposuspension (Burch procedure), a pubovaginal sling, and recently, the new mid-urethral

slings (TVT/TOT) which are largely modifications of the pubovaginal sling¹¹.

15.1 Clinical Trials

A systematic review for mid-urethral slings in MUI included six randomized trials and seven prospective studies. There was heterogeneity in the outcomes reported. The authors concluded on the meta-analysis of five RCTs in women with MUI symptoms that long-term follow-up RCTs of retropubic and transobturator tapes are needed particularly for women with urodynamically proven and symptomatic MUI³⁹.

15.2 Complementary and Alternative Medicine

The National Center for Complementary and Alternative Medicine at the National Institutes of Health (NIH) has grouped complementary and alternative medicine (CAM) into 5 domains: “(1) *biologically-based therapies [nutraceuticals and dietary modifications]* (2) *mind-body interventions [yoga and biofeedback]* (3) *body-based and manipulative approaches [massage]* (4) *energy therapies [Qigong and Reiki]* (5) *whole medical systems [traditional Chinese medicine, Unani medicine, acupuncture and naturopathy]*”. The authors have discussed the research and clinical experience about the efficacy of each complementary and alternative medicine therapy in the treatment of urinary incontinence⁴⁰.

16. Clinical Trials

In a RCT, authors proved that mace was safe and effective for the subjective improvement of MUI symptoms and thereby improved women’s HRQoL than the placebo⁴¹.

Another study proved that *Cyperus scariosus* and *Boswellia serrata* plus PFMT showed a more positive effect with regards to improvement in HRQoL and a better alternative than PFMT alone in SUI women⁴².

A single-blind, prospective, randomized placebo-controlled study proved that *Boswellia serrata* L. and *Cyperus scariosus* L. plus PFMT was more effective and safe than placebo in the reproductive age SUI women⁴³. The researchers reported that of 60 patients sanguine and phlegmatic temperament was found in 31(52%) and 29(48%) patients, respectively. Maximum number of women were in the age group of 31–40 years (n = 38, 63%)

in which 55% (n = 17) and 72% (n = 21) had sanguine and phlegmatic temperament, respectively⁴⁴.

A study conducted to evaluate the efficacy and safety of electroacupuncture for women with Mixed Urinary Incontinence (MUI), the test group patients received electroacupuncture (36 sessions) over 12 weeks with 24 weeks of follow-up and in the control group PFMT-solifenacin (5 mg/d) over 36 weeks. The study concluded that moderate to severe MUI in women, electroacupuncture was similar to PFMT-solifenacin⁴⁵.

17. Conclusion

Female MUI is an under-reported as disorder and women frequently hesitant to talk about it with healthcare professionals. Further, it is an under-treated condition as misperceptions concerning its etiology and responsiveness to therapy. In epidemiologic studies, MUI women usually have severe symptoms than pure SUI or UUI women. As a result, MUI women usually take the treatment. In general, clinicians treat the MUI as it is the most symptomatic, bothersome, and easily treated. The management includes anti-incontinence devices, biofeedback, behavioral modification, Pelvic Floor Physiotherapy (PFMT), pharmacotherapy, and complementary therapies to treat MUI.s

18. References

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