



## Letter to the Editor

### Antimicrobial Silver Zeolite and Urinary Incontinence in Patients with Alzheimer's Disease

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Urinary incontinence (UI) is prevalent in the elderly population due to loss of bladder control, and can have significant unpleasant consequences for patients and their caregivers (1). It may be associated with seizures, pressure on the spinal cord, and urinary sensory nerves due to vertebrae's compressive effects on patients, social isolation, depression, stress, and anxiety (2). The prevalence of UI is higher in women, the elderly, and people with cognitive and physical disabilities (1). According to the Centers for Disease Control and Prevention, 43.8% of noninstitutionalized Americans over 65 and 70.3% of nursing home residents reported UI (3). In the general population, the family and those around them are the primary caregivers of the elderly. Bathing and dressing these people by caregivers is challenging and important, especially if the person has other complex and numerous medical issues (4). These include decreased bladder capacity, enlarged prostate, increased involuntary contractions of the bladder muscles, decreased estrogen levels, increased fluid intake at night and production of urine at night, and changes in the immune system. Studies show that the prevalence of Urgency UI is one of the most common types of UI in humans, which also increases with age (5). Reasons include hearing the sound of running water, seeing the symbols and signs of bathing, being exposed to the cold, drinking large amounts of fluids, and taking diuretics. This way, the person urinates before reaching home and removing his clothes (6).

#### Proposed solutions based on the causes of UI

1. Use a spray like desmopressin (DDAVP): This drug retains body fluids, is less secreted by the kidneys, and enters the urinary tract system.

2. Training to use fluids at the right time
3. Reduce caffeine consumption (coffee and tea)
4. Delayed emptying of the bladder
5. Kegel (Pelvic floor muscle) exercises
6. Management of fluid intake
7. Electrical stimulation
8. Neuromodulation
9. Penile clamp

#### Limitations of the mentioned methods

1. Alzheimer's disease (AD) patients are unable to perform pelvic floor exercises.
2. Requires high concentration and perception to regulate fluid intake
3. Conditioning the bladder
4. Use of pills and sprays (medicines prescribed for UI have side effects such as cognitive impairment and memory loss)
5. Eating disorders and drinking habits among the elderly

Caring for individuals with AD presents unique challenges, particularly in managing UI, which can occasionally contribute to elder abuse, such as restricting fluid intake or resorting to violence. This humiliation ultimately accelerates the progression of AD and transfers these patients to elderly care centers. Families who personally care for their elderly are deprived of their relatives due to the unpleasant odor of urine caused by UI of the elderly at home. Also, recurrent urinary tract infections (UTI) are one of the problems of these patients, which in addition to the high use of antibiotics in these people; increase the cognitive problems of patients. The most common organisms causing UTI are *Escherichia coli*, followed

by other Enterobacteriaceae species such as *Proteus* and *Klebsiella*. Gram-positive bacteria such as *Enterococcus* and *Staphylococcus aureus* are also less commonly reported (7).

None of the above solutions can adequately solve the problem of UI in AD patients, so we need a new method to solve this problem.

The newly proposed method is to use underwear that helps the AD patient with UI not to feel alienated from the clothes, to eliminate the unpleasant odor of the urine, be economical, easy to use, and washable and maintain a high volume of urine. The primary raw material of this dress is zeolite. Zeolites are porous crystals based on  $AlO_4$  and  $SiO_4$ , naturally or synthetically hydrated bonded by oxygen atoms. This mineral is an essential application in the medical industry. They are also used as strong adsorbents, catalysts, and detergent manufacturers in industry, agriculture, veterinary medicine, health supplies, and environmental protection. This mineral also accelerates the healing process of wounds and surgical incisions and is also known as bactericidal and fungicidal, which prevents odor and inflammation of the skin (8).

Silver is also used as an effective antimicrobial in medical devices. Various studies have mentioned the use of silver and how it is released on different platforms. The zeolite platform has been introduced as suitable for storing and releasing silver (9). Because zeolite aluminosilicate has a negative charge, silver ions can be easily combined with ion exchange. Various studies have shown the composition of silver zeolite in polymers, textiles and metal coatings, dentistry, and medicine (10).

Silver zeolite, known for its outstanding water absorption, anti-odor, and antibacterial properties, holds potential for implementation in the underwear of AD patients. By incorporating silver zeolite, addressing and managing various challenges associated with UI, including issues like urine odor and recurrent urinary tract infections prevalent within this demographic, becomes feasible.

### Conflict of interest

There is no conflict of interest to be declared.

### Authors' Contribution

RB designed and revised the study; BM designed the study and wrote the primary draft. MS designed the study and wrote the primary draft, and submitted it. All authors have read this manuscript and they are agreed with this submission.

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