Journal of Aging Research & Clinical Practice©
Volume 6, 2017

J Aging Res Clin Practice 2017;6:139-142
Published online June 29, 2017, http://dx.doi.org/10.14283/jarcp.2017.16

THE POTENTIAL ROLE OF DIETARY FACTORS ON URINARY INCONTINENCE IN THE ELDERLY

E.P. Cherniack, H.F. Lee

Abstract: Maintenance of urinary continence is a complex physiological process. Multiple morbidities can alter this process including polypharmacy, and age-related loss of physiological function. An increasing body of evidence suggests the importance of dietary factors and ingested substances. Modification of nutrients and ingested substances might prove beneficial adjunctive therapies in the treatment of incontinence, but remain unproven. Extrapolation of the results of epidemiologic studies of the relationship of excess caloric intake to continence, from the general adult population, suggests trials of weight loss might help. Population studies of vitamin D supplementation and continence also suggest an association, but prospective experimental trials involving vitamin D supplementation have yet to be done. A potential but far more equivocally documented relationship exists for vitamin B12 and continence. Surprisingly little evidence exists for other potential risk factors for incontinence such alcohol and sweeteners, natural or artificial. Future research should involve prospective trials of weight loss and vitamin D, and exploration of the relationship between other dietary factors and continence.

Key words: Urinary incontinence, diet.

Introduction

Urinary incontinence is a prevalent, persistent health and quality of life problem in the elderly, occurring in 20-40 percent of older adults (1, 2). Incontinence has major societal implications, ranking as the second most common medical condition leading to institutionalization. The causes of incontinence are multifactorial, and successful treatment can be challenging. Treatments can include devices (such as those to absorb and retain urine), medications, pelvic floor muscle exercises, surgery, and dietary modification.

Maintenance of urinary continence requires complex neuromuscular coordination, and substances ingested as part of the diet may play an important role. In addition to the role of water, an increasing body of evidence delineates the role of other dietary factors. High caloric intake, fat, acidic foods, vitamin D, vitamin B12, and other nutrients such as calcium, alcohol, zinc, and vitamin C may also influence urinary continence. The purpose of this manuscript is to describe what is known from published evidence about the relationship of dietary factors and the pathogenesis of urinary incontinence in the elderly.

Methods

A literature search was conducted through the PubMed database using such search terms as "urinary incontinence", "nutrients", and "diet", and secondary sources were obtained from the primary sources. Unfortunately, due to the paucity of studies, a systematic review could not be performed.

Excess energy intake (calories, fat)

A number of studies delineate an association between higher energy intake and greater likelihood of urinary incontinence, including in elderly individuals. Spanish investigators measured anthropomorphic parameters in 471 community-dwelling women who were at least 65 years old (3). Subjects with poorer fitness as manifested by increased body fat percentage, waist circumference, and body mass index, had a higher incidence of urinary incontinence. ($p<0.05$) Obese subjects (Body Mass Index [BMI>30]) were more likely to suffer from stress incontinence than other types. Unfortunately, this is the only study that attempted to define this association specifically in elderly individuals.

Division of Geriatrics and Palliative Medicine, University of Miami Miller School of Medicine and the Bruce W. Carter Miami VA Medical Center

Corresponding Author: E. Paul Cherniack, Room CLC 445, Miami VA Medical Center, 1201 NW 16 St., Miami, FL 33125, evan.cherniack@va.gov, 3055757000 ext. 2273

Received February 22, 2017
Accepted for publication March 29, 2017

Other studies including, but not limited to older persons, suggested a relationship between excess body weight, an indirect manifestation of higher caloric intake, and incontinence. In one group of 200 postmenopausal Turkish women, age ranges 47-73, an association existed between the presence of metabolic syndrome and stress incontinence ($p<0.001$) (4). That group was part of larger investigation in which two hundred other premenopausal women also participated. In the population overall, larger waist circumference also correlated with a greater incidence of stress incontinence ($p<0.05$). In a mail survey of 6424 participants from the UK, investigators observed that women at least age 40 with a BMI of over 30 suffered from stress (OR=1.74; 95% CI 1.22-2.48) or urge (OR 1.46; 95% CI 1.02-2.09) incontinence more often than normal weight individuals (5). In a second mail survey from the same population, 5816 women, all aged 40 or older, responded to a survey about urinary symptoms and diet (6). The survey ranked amounts of ingested foodstuffs by quintile of intake. Higher quintiles of fat and sugar intake correlated with increased incidence of stress incontinence.

Vitamin D

While excess macronutrient intake impairs urinary continence, lack of micronutrients may impede continence. Several epidemiologic investigations have outlined a relationship between insufficient vitamin D and incontinence. In one survey, University of Alabama researchers measured 25-hydroxyvitamin D baseline concentrations in 350 community-living adults, half male, mean age of 74 (7). Forty-two months after baseline assessment, investigators observed an association in the cumulative incidence of urge incontinence over the course of the study with vitamin D insufficiency, (defined as 20-30ng/ml) ($p=0.03$). However, statistical analysis revealed no significant association between vitamin D levels and time to incident urinary incontinence, assessed every six months during the course of the study.

A second epidemiologic study confirmed the relationship between vitamin D and continence. Turkish investigators at an outpatient geriatrics clinic assessed serum vitamin D levels in 705 patients, 68.2% female, mean age 72.3 years old (8). An analysis of Vitamin D concentrations noted an inverse relationship between vitamin D sufficiency and incidence of urge incontinence ($p=0.013$). The researchers suggested these relationships might be the result of vitamin D action on both smooth and skeletal muscle function.

Other studies that included, but did not focus specifically on an elderly population, also found a relationship between vitamin D levels and UI. In a retrospective cohort study, Parker-Autry et al measured 25-OH-vitamin D concentrations in 394 women, average age 62, from a urogynecology clinic population (9). More symptoms of incontinence, as measured by the Incontinence Impact Questionnaire (a seven question quality of life questionnaire), correlated with vitamin D insufficiency (25-29ng/ml) in women ($p<0.001$). The researchers opined that these findings imply an important role for vitamin D in skeletal muscle efficiency, specifically in the pelvic floor musculature.

Further anecdotal reports outlined a role for vitamin D in incontinence treatment. At Ohio University, a 78 year old woman with a 6 month history of urge urinary incontinence received 6 months of weekly treatments of 50,000IU of vitamin D2, with complete resolution of her incontinence (10). The patient's initial serum vitamin D concentration of 10ng/ml increased to 54ng/ml following these treatments. Similarly, at the same institution, 50,000IU weekly vitamin D2 restored continence in a 59 year old with stress incontinence (10).

Vitamin B12

Vitamin B12 is another micronutrient with the potential to influence continence. At the University of Pittsburgh, a case-control study of 208 geriatric outpatients 65 years and older examined a potential a link between urinary incontinence and serum vitamin B12 concentrations. The investigation matched cases with incontinence with controls of comparable age, race, sex, cognitive function, genitourinary conditions, medications, and mobility. Subjects with incontinence were 2.63 times more likely to have vitamin B12 deficiency, defined as serum vitamin B12<250pg/ml ($p=0.026$) than controls. As a cause-effect relationship could not be determined from such a study, the researchers recommended a controlled trial of vitamin B12 supplementation in incontinent patients, which, unfortunately, still remains forthcoming in the two decades since this report (11).

Other studies suggest a more ambiguous relationship between vitamin B12 and incontinence. In a retrospective analysis conducted at the University of Nebraska geriatrics clinic, researchers investigated the relationship between serum vitamin B12 levels and both urinary and fecal incontinence in 929 elderly outpatients at least 65 years old (12). Covariates which contribute to incontinence including functional status, cognitive status, age, race, gender, medical illnesses, and medications, were also assessed. Although those patients with vitamin B12 deficiency, defined as less than or equal to 300pg/ml, with both fecal and urinary incontinence were more than two times more likely to have dual fecal and urinary incontinence ($p=0.03$), no significant relationship was found between vitamin B12 deficiency and isolated urinary incontinence. Unfortunately, this study did not examine the relative severity of incontinence, and failed to examine many other covariates involved in the pathogenesis of incontinence, such as the presence of diabetes, stroke, and prostate diseases (2). Among 119 community-dwelling Canadians, all ages 65-89, investigators did not detect an association between vitamin B12 serum concentrations of less than 165

ρmol/L and incontinence (13).

In addition, a prospective cross-sectional study of 119 elderly community-dwelling subjects also presented conflicting evidence. This investigation defined vitamin B12 deficiency as serum B12 <165pg/ml, and assayed serum vitamin B12 and other, more precise markers of deficiency, methylmalonic acid and homocysteine concentrations. No significant relationship existed between urinary incontinence, serum B12 (p=0.424), methylmalonic acid levels (p=0.386), or homocysteine concentrations (p=0.535).

Caffeine

Caffeine would seem to possess a common-sense role in the maintenance of continence. However, in the elderly, caffeine plays a less explicit role based on the published scientific literature. In fact, studies specifically in the elderly remain forthcoming. Therefore, the exact relationship to date can be only inferred from studies in younger individuals, which thus far provide conflicting evidence. In Korea, an epidemiological study noted an association between caffeine and postmenopausal women age 50 and older (14). In this population, including 4,028 women, mean age 63, a correlation existed between the highest tertile of caffeine intake (>150mg/d) and incontinence as determined by both physician (p=0.012) and subject report (p=0.04). A US study gleaned from NHANES data noted a correlation between an intake of at least 204mg/d, the uppermost quartile, and urinary incontinence (OR=1.47; 95%C 1.07-2.01) (15). The study also ascertained specific types of incontinence among subjects, and their severity, but observed no relationship between any of these and continence.

Discussion

Numerous studies explored several dietary factors that might play a role in the pathogenesis and progression of urinary incontinence. Unfortunately, the evidence to date on such dietary factors in urinary incontinence is lacking. The literature is largely based only on epidemiologic studies, leaving much to be investigated in more prospective, controlled trials. Furthermore, most researchers to date have used only subjective measures to quantify incontinence. Importantly, very few studies have investigated these relationships specifically in the elderly. Urinary incontinence significantly impacts the quality of life of the elderly population, and as such, future studies to investigate both possible preventative and curative dietary interventions in the elderly will be crucial.

To date, evidence suggests an association between higher body fat and stress urinary incontinence in the elderly. In addition, studies in younger persons have demonstrated associations between urinary incontinence and metabolic syndrome, BMI>30, and high fat and sugar intake, and demonstrated decreased incontinence following weight loss. Researchers have hypothesized that obesity may increase intra-abdominal pressure, leading to increased intra-vesicular pressure and effects on pelvic floor musculature and urethral mobility, worsening both stress and urge urinary incontinence (3, 16, 17). However, investigation into these associations in the elderly is lacking. Neuromuscular electrophysiological studies of the pelvic floor musculature before and after an intervention might help confirm a role for excess calories in the pathogenesis of incontinence and suggest weight loss as a potential treatment. Future studies might focus on weight loss as a potential treatment specifically in the elderly, who most likely suffer the deleterious effects of incontinence.

Another important but related question that remains to be investigated is whether sugar and sweetener intake is independently associated with urinary incontinence. Sugar and high-glycemic food intake, although known to play a role in weight gain and development of metabolic syndrome, have not been independently studied in relation to urinary incontinence. Many clinicians tout avoidance of even artificial sweeteners and spicy foods to alleviate incontinence, but these await formal trials as to benefit.

Studies in the elderly have demonstrated a consistent association between vitamin D deficiency or insufficiency and urinary incontinence in the elderly. Investigators have proposed that the presence of Vitamin D receptors on the pelvic floor musculature, prostate tissue, and bladder muscle itself suggests a role of vitamin D in function of these structures and maintenance of urinary continence (7-9, 18, 19). However, future studies should investigate vitamin D supplementation as a putative treatment for urinary incontinence in the elderly. The evidence on the association between Vitamin B12 and urinary incontinence is conflicting. Further research is needed to determine whether there exists a correlation strong enough to recommend vitamin B12 supplementation for the prevention or treatment of urinary incontinence. However, the benefit of supplementation of either vitamin may require treatment over long periods of time.

The literature, albeit conflicting, suggests a positive correlation between increased caffeine intake and worsening urinary incontinence in younger populations. Further study might be directed at the effect of caffeine in the elderly, in order to determine whether providers should suggest decreased intake for their elderly patients suffering with incontinence. Other dietary factors - including alcohol, calcium, food types, and fiber intake - show weaker possible associations with urinary incontinence.

A more robust response to weight loss might be obtained in future studies combining weight loss with other dietary approaches. Perhaps weight loss together with vitamin D supplementation, for example could prove beneficial in the management of urinary

incontinence.

Conflicts of interests: None

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