indicator of a gene involved in eating behaviors.

The *ADIPOQ* gene spans 17 kb, contains three exons, and its translation starts at exon 2 and ends at exon 3 (32,33). SNPs throughout the gene or nearby have recently been related to the circulating levels of adiponectin in GWASs (34–36) or in studies genotyping tag SNPs (33,37). SNPs representing the most significant associations, however, vary considerably among studies. They are distributed throughout or nearby the *ADIPOQ* gene from upstream (e.g., rs864265), through the promoter region (e.g., rs822387, rs17300539), intron 1 (e.g., rs16861210, rs17366568), exon 2 (e.g., rs2241766), and intron 2 (e.g., rs3774261), to the 3′ untranslated region (UTR; e.g., rs6773957, rs2082940). These SNPs are frequently in LD with one another, so that researchers cannot easily focus on the genetic polymorphisms that are responsible for the adiponectin levels.

The rs822396 polymorphism associated with the confectionery-intake score in the present study was also in LD, albeit weak-to-moderate, with some of the previously mentioned polymorphisms, including rs864265, rs822387, rs3774261, rs6773957, and rs2082940 in a Japanese population within the International Haplotype Map (HapMap) project (http://hapmap.ncbi.nlm.nih.gov/). Therefore, even if the rs822396 polymorphism is not directly linked with circulating adiponectin levels, genetic polymorphisms of *ADIPOQ* around the rs822396 SNP might control blood adiponectin levels, and could be associated with a propensity to favor foods of high-energy density such as confectionery. Additionally, alternative splicing sites of the *ADIPOQ* gene have been found near this SNP (within 4 kb upstream and downstream of the SNP; http://www.ensembl.org/Homo_sapiens/Gene/Splice?db=core;g=ENSG00000181092;r=3:186560479-186576252;t=ENST00000444204). Thus, the rs822396 SNP might affect the expression of *ADIPOQ* through alternative splicing.

Interestingly, the Québec Family Study by Choquette *et al.* involving genome-wide linkage analysis found linkage on chromosome 3q27.3 with intakes of energy, lipid, and

carbohydrate (38). As the 3q27 region harbors the *ADIPOQ* gene, the current study might corroborate these earlier findings, suggesting that a variation of this gene is associated with the intake of high-calorie foods.

The association with the confectionery-intake score showed genome-wide significance for SNP rs2839525 in the stage 1 study (Table 2, $P = 5.5 \times 10^{-9}$). This was, however, not replicated in stage 2. Although we could not identify the precise reason for this discrepancy, highly significant associations found in GWASs have often failed to be replicated (39).

Although we identified and replicated an association of the rs822396 polymorphism with the confectionery-intake score, it did not reach genome-wide significance ($P < 10^{-8}$) either in stage 1 alone or in the pooled analysis of stages 1 and 2, and the association was comparatively weaker in stage 2. This might have been partly due to the relatively small number of participants ($n = 939$) in stage 1, or the simplistic self-reporting method used to assess the intake frequencies of Japanese-style and Western-style confectionery. Moreover, the difference in background characteristics of participants between the studies might have partly accounted for the weaker association in stage 2 than stage 1. The two populations differed notably in age: the average age for the stage 2 group was 8 years higher than that for stage 1 (Table 1). The association of the rs822396 polymorphism with the confectionery-intake score was much stronger in the younger group (< 55 years; Table 3). When we analyzed data only from the stage 2 study by age stratum (< 55 and ≥ 55 years), as in Table 2, the association of SNP rs822396 was more dominant in the younger age strata (n = 1,772; β for additive model = 0.0487; $P = 0.008$) than in the older one ($n = 2,717$; β = 0.0090; $P = 0.56$). The older age distribution of the population in stage 2 might therefore have attenuated the SNP association compared with that in stage 1; the association might have been more replicable if the stage 2 population had been more similar in age distribution to that in stage 1.

Although a more detailed questionnaire including questions on portion sizes might have provided more conclusive findings, informative data were obtained in a previous familial study based on simple questions about the intake frequencies of sweet foods (9). Furthermore, the association of an SNP in the *ADIPOQ* gene with the intake of high-energy foods such as confectionery is biologically plausible and supports the findings of a previous analysis (38).

In summary, we found that an SNP in the *ADIPOQ* gene was correlated with a preference for confectionery through a two-stage GWAS with discovery and replication phases. Given the biological plausibility and relevant previous findings, this association warrants further follow-up and provides a good working hypothesis for experimental testing.

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Figure legends

Figure 1 Genome-wide $-\log_{10} P$ value plot for stage 1 discovery analysis of confectionery-intake score. Blue line indicates the criteria for stage 2 replication phase ($P = 1 \times 10^{-5}$).

Figure 2 Q-Q plot for stage 1 discovery analysis of confectionery intake score. λ = 1.003.

Table 1 Background characteristics of participants

Characteristics	**Stage 1**	**Stage 2**	**Stage 1 + 2**	***P* (stage 1 vs. 2)**
N	939	4,491	5,430	
Women (%)	48.9	53.0	52.3	0.022
Age (years)	47.9 ± 16.3	55.8 ± 8.9	54.4 ± 10.9	< 0.001
Current drinkers (%)	56.0	56.1	56.1	0.95
Ex-drinkers (%)	4.5	1.9	2.4	< 0.001
Current smokers (%)	28.6	17.4	19.3	< 0.001
Ex-smokers (%)	20.5	22.7	22.3	0.14
Body mass index (kg/m^2)	22.5 ± 3.1	23.2 ± 3.2	23.0 ± 3.2	< 0.001
Confectionery intake score	0.30 ± 0.32	0.28 ± 0.27	0.28 ± 0.28	0.085

Values are means ± standard deviation (SD).

Table 2 SNPs identified in GWAS analysis for confectionery intake score (n = 939 for stage 1 and 4,491 for stage 2)

SNP ID	Chromo-some	Position (NCBI Build 36.3)	Major allele[a]	Minor allele[a]	Nearby gene	Minor allele frequency			β for additive model			*P* for additive model		
						Stage 1	Stage 2	Stage 1+2	Stage 1	Stage 2	Stage 1+2	Stage 1	Stage 2	Stage 1+2
rs17042603	2	21651923	A	G	No gene	0.052	0.050	0.050	0.1568	0.0155	0.0410	1.8×10^{-6}	0.23	7.0×10^{-4}
rs822396	3	188049571	A	G	*ADIPOQ*	0.055	0.060	0.060	0.1643	0.0234	0.0461	2.8×10^{-7}	0.049	4.2×10^{-5}
rs13356198	5	129284991	A	G	*CHSY3*	0.055	0.064	0.062	0.1432	0.0172	0.0362	4.7×10^{-6}	0.14	9.1×10^{-4}
rs1147522	6	72640321	C	T	*RIMS1*	0.017	0.017	0.017	0.3017	0.0043	0.0580	4.3×10^{-8}	0.84	4.5×10^{-3}
rs3897749	7	85972133	G	T	No gene	0.065	0.060	0.061	0.1379	-0.0104	0.0168	3.4×10^{-6}	0.38	0.13
rs6474850	9	14652459	G	A	*ZDHHC21*	0.182	0.167	0.170	0.0911	-0.0044	0.0129	2.4×10^{-6}	0.56	0.069
rs2890992	9	14662267	T	C	*ZDHHC21*	0.141	0.122	0.126	0.1001	-0.0006	0.0177	2.7×10^{-6}	0.95	0.026
rs10810211	9	14666870	A	G	*ZDHHC21*	0.128	0.118	0.120	0.0976	-0.0010	0.0168	7.8×10^{-6}	0.90	0.037
rs12351510	9	28641898	T	G	*LINGO2*	0.014	0.015	0.015	0.2834	-0.0039	0.0494	8.5×10^{-7}	0.86	0.022
rs6039211	20	8564588	A	G	*PLCB1*	0.479	0.535	0.525	0.0652	-0.0035	0.0072	9.97×10^{-6}	0.53	0.18
rs2839519	21	42740913	G	A	*UBASH3A*	0.177	0.170	0.171	0.0998	-0.0118	0.0077	1.9×10^{-7}	0.11	0.27
rs2839525	21	42750006	T	G	*UBASH3A*	0.181	0.174	0.175	0.1103	-0.0084	0.0123	5.5×10^{-9}	0.25	0.075

[a] Alleles are indexed to the forward strand of Center for Biotechnology Information (NCBI) Build 36.3.

Table 3 Mean confectionery intake score by rs822396 genotype and background characteristics of participants in the pooled dataset (stage 1 and 2 studies)

Characteristics		Major homozygotes			Heterozygotes + minor homozygotes			*P*
		n	Mean (SE)[a]		n	Mean (SE)[a]		
All participants		4,800	0.278	(0.004)	628	0.326	(0.011)	4.6×10^{-5}
Gender	Male	2,288	0.221	(0.005)	302	0.275	(0.014)	3.4×10^{-4}
	Female	2,512	0.331	(0.006)	326	0.373	(0.017)	0.018
Age (years)	<55	2,085	0.271	(0.006)	254	0.354	(0.017)	5.1×10^{-6}
	≥55	2,715	0.284	(0.005)	374	0.308	(0.014)	0.12
Smoking	Never smokers	2,784	0.318	(0.005)	380	0.362	(0.015)	4.7×10^{-3}
	Current or ex-smokers	2,009	0.222	(0.006)	248	0.273	(0.017)	3.6×10^{-3}
Alcohol drinking	Never drinkers	1,985	0.325	(0.007)	266	0.366	(0.018)	0.034
	Current or ex-drinkers	2,810	0.245	(0.005)	361	0.296	(0.014)	5.9×10^{-4}
Body mass index (kg/m^2)	<25	3,638	0.278	(0.004)	494	0.330	(0.012)	5.8×10^{-5}
	≥25	1,118	0.279	(0.009)	128	0.310	(0.026)	0.26

[a] Adjusted for gender and age.

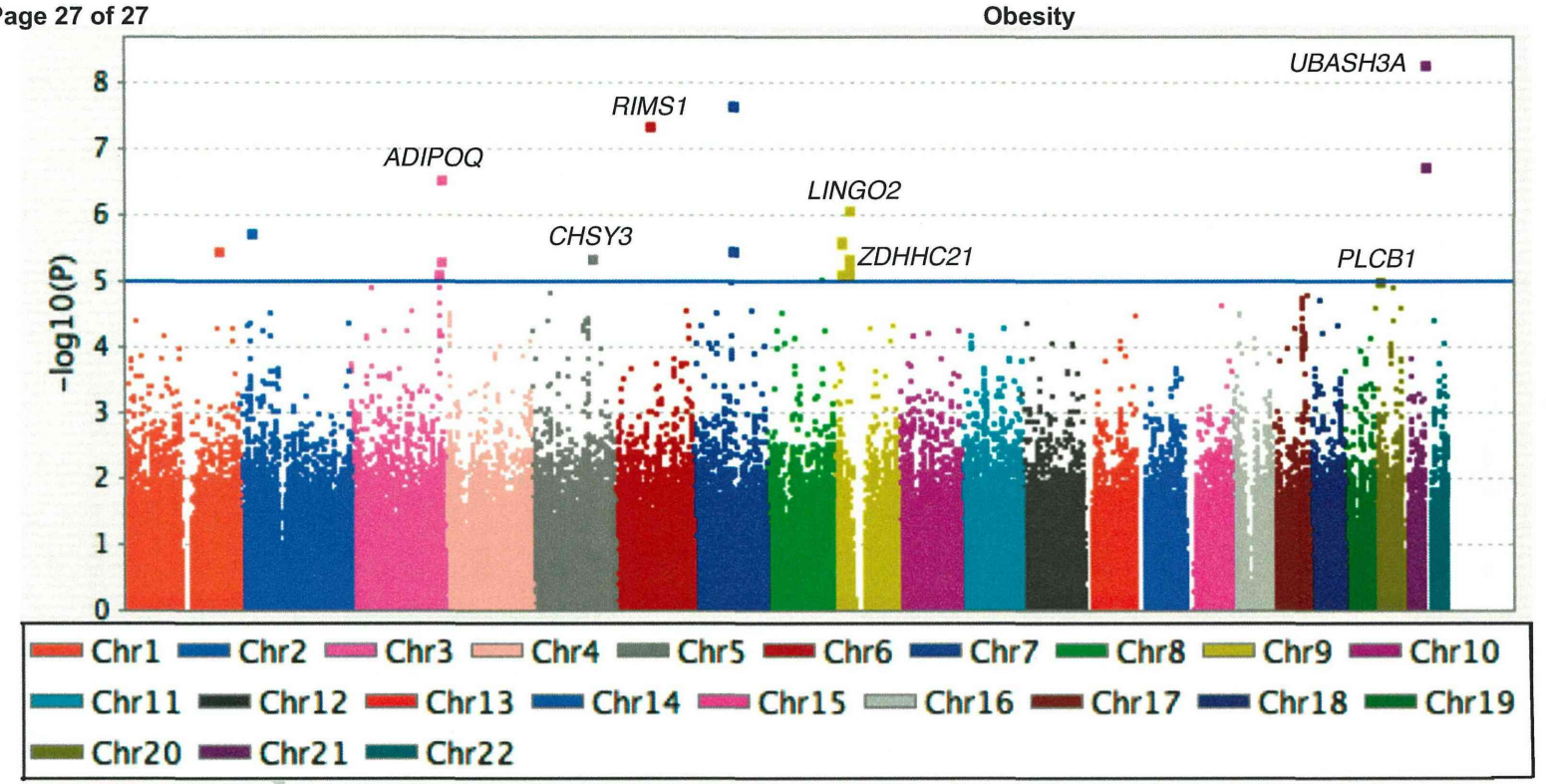

Figure 1

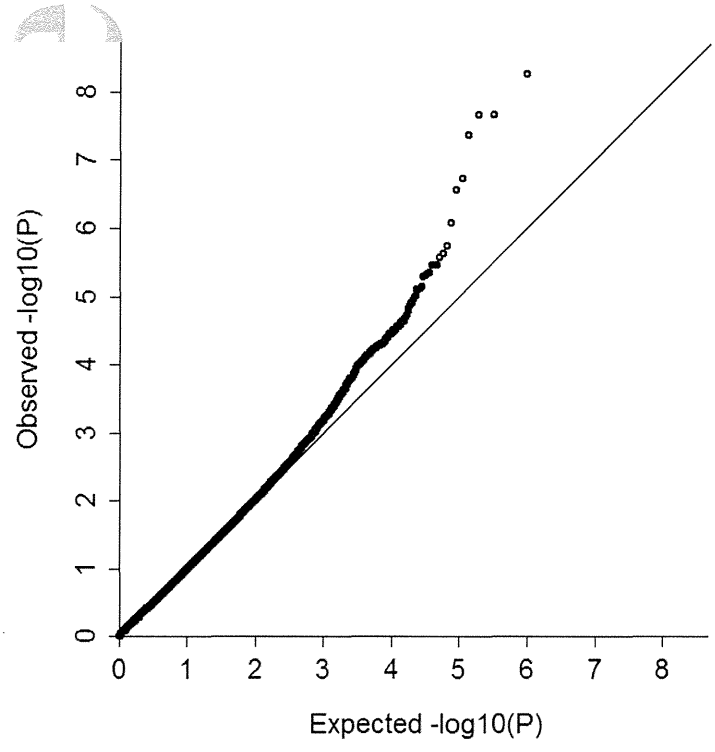

Figure 2

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Original Article

Prevalence of postmicturition urinary incontinence in Japanese men: Comparison with other types of incontinence

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Abbreviations & Acronyms
BMI = body mass index
ICIQ-SF = International Consultation Society Incontinence Questionnaire Short Form
MUI = mixed urinary incontinence
OR = odds ratio
PUI = postmicturition urinary incontinence
SUI = stress urinary incontinence
UI = urinary incontinence
UUI = urge urinary incontinence

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Objective: To investigate the prevalence and correlates of postmicturition urinary incontinence in Japanese men, and to compare with those of other types of urinary incontinence.

Methods: A total of 3224 male participants in a community-based survey were investigated. Three types of urinary incontinence were assessed; that is, postmicturition urinary incontinence, stress urinary incontinence and urge urinary incontinence. Age, body mass index, alcohol intake, cigarette smoking, and medical history of 18 diseases and conditions were the dependent variables for candidate correlates of the three types of incontinence.

Results: Unlike stress urinary incontinence and urge urinary incontinence, the prevalence of postmicturition urinary incontinence was constant throughout all generations (6.5% for the 30 s, 6.6% for the 40 s, 6.0% for the 50 s, 6.3% for the 60 s and 5.1% for the 70 s). The independent correlates for postmicturition urinary incontinence were asthma ($P < 0.001$; odds ratio 3.01), prostatic disease ($P < 0.001$; odds ratio 2.38), rhinosinusitis ($P = 0.001$; odds ratio 1.92), low back pain ($P = 0.003$; odds ratio 1.58), sleeplessness ($P = 0.013$; odds ratio 1.86), depression ($P = 0.024$; odds ratio 3.41) and body mass index ($P = 0.025$; odds ratio 0.73).

Conclusions: Postmicturition urinary incontinence has different characteristics from those of stress urinary incontinence and urge urinary incontinence. Unlike stress urinary incontinence and urge urinary incontinence, postmicturition urinary incontinence is not age-dependent. Several diseases related to an allergic status, such as asthma and rhinosinusitis, are correlates for postmicturition urinary incontinence.

Key words: epidemiology, male, urinary incontinence.

Introduction

UI affects substantial proportions of men. The estimated prevalence of UI increases with age, from 4.8% in men aged 19–44 years to 21.1% in men older than 65 years.[1] As most previous epidemiological studies assessing male UI focused on UUI, SUI and MUI, the prevalences and risk factors for these types of UI have been well investigated. These types of UI in men, especially UUI, result in considerable distress and deterioration of the quality of life.[2,3]

Postmicturition dribble is another type of UI, and is classified as a postmicturition symptom. This symptom has been defined by the International Continence Society in 2002 as involuntary loss of urine immediately after the individual has finished passing urine, usually after leaving the toilet in men,[4] and is distinct from terminal dribbling.[5] Several studies have found that the prevalence of postmicturition dribble is relatively high in men,[2,6–9] and the degree of distress caused by this symptom is substantial.[2] However, more

detailed information about this symptom, such as its age-stratified prevalence and correlates, is scarce.[8] In the present study, we investigated the prevalence and correlates of male postmicturition dribble using data from a Japanese cohort population, in comparison with those of other types of UI. We refer to postmicturition dribble as PUI hereafter, because we want to emphasize an aspect of urinary incontinence with this symptom for comparisons with other types of UI.

Methods

The Nagahama cohort project is a prospective study composed of a questionnaire survey, anthropometric measures, physiological measures, biochemical measures from blood samples and genomic information.[10] The baseline data for the study population were obtained from August 2008 to November 2010. All the protocols and informed consent procedures were approved by the Kyoto University Graduate School and Faculty of Medicine Ethics Committee, the ad hoc Review Board of the Nagahama Cohort Project, and the Nagahama Municipal Review Board of Personal Information Protection.

Although the questionnaire was designed to be self-reporting, the interviewers confirmed the appropriate answer by interview if no answer was written to minimize the lack of data. Self-reported information on the medical history, major comorbidities, current medication use, lifestyle and psychosocial factors were also collected. The three types of UI; that is, SUI, UUI and PUI, were assessed using the ICIQ-SF, the Japanese version of which has been validated for use.[11] When assessing the prevalence of UI, we examined all severities of UI; that is, "about once a week or less often" or more in frequency and "a small amount" or more in volume. When assessing the severity of UI, we classified it into the following three levels: mild, once or less per week; moderate, two or three times per week; severe, once or more per day.

The independent variables used in the analyses for correlates of the three types of incontinence were age; BMI; alcohol intake; cigarette smoking; and 18 medical history diseases and conditions, comprising low back pain, hypertension, rhinosinusitis, dyslipidemia, prostatic disease, diabetes mellitus, gout, sleeplessness, hepatic disease, coronary artery disease, anemia, malignant disease, atopic dermatitis, asthma, depression, reflux esophagitis, renal disease and stroke. Several diseases or conditions included in the questionnaire were omitted from the analyses because of their low prevalence or relation to injury.

Statistics

Statistical analyses were carried out using a logistic regression model. Univariate analyses were first carried out to confirm the basic relationships between each independent variable and the three types of UI. If the univariate analysis produced a *P*-value of less than 0.25, the variable was applied to a multivariate analysis. All *P*-values were two-sided, and values of $P < 0.05$ were considered significant. SPSS version 13.0 (SPSS, Chicago, IL, USA) was used for all calculations.

Table 1 Characteristics of the participants

Age (years)	
30–39	673 (20.9%)
40–49	381 (11.8%)
50–59	481 (14.9%)
60–69	1201 (37.3%)
70–	488 (15.1%)
BMI (kg/m^2)	
<18.5	108 (3.3%)
18.5–24.9	2243 (69.6%)
25.0–29.9	776 (24.1%)
30≤	97 (3.0%)
Alcohol (yes)	2617 (81.2%)
Smoking (yes)	991 (30.7%)
Medical conditions	
Low back pain (yes)	1743 (54.1%)
Hypertension (yes)	791 (24.5%)
Rhinosinusitis (yes)	385 (11.9%)
Dyslipidemia (yes)	366 (11.3%)
Prostatic disease (yes)	299 (9.3%)
Diabetes (yes)	295 (9.2%)
Gout (yes)	237 (7.4%)
Sleeplessness (yes)	211 (6.5%)
Hepatic disease (yes)	184 (5.7%)
Coronary artery disease (yes)	176 (5.5%)
Anemia (yes)	159 (4.9%)
Malignant disease (yes)	144 (4.5%)
Atopic dermatitis (yes)	136 (4.2%)
Asthma (yes)	127 (3.9%)
Depression (yes)	115 (3.6%)
Reflux esophagitis (yes)	104 (3.2%)
Renal disease (yes)	87 (2.7%)
Stroke (yes)	38 (1.2%)

Results

A total of 3228 male residents participated in the Nagahama project. Of these, four residents were excluded from the study because of insufficient data. The data for the remaining 3224 (99.9%) residents were evaluated in the study. The characteristics and distributions of the participants are shown in Table 1.

Overall, 441 residents (13.7%) had some type of UI. Of these, 334 (10.4%), 46 (1.4%) and 61 (1.9%) residents had mild, moderate and severe UI, respectively. The prevalences of mild UI and moderate to severe UI increased with aging

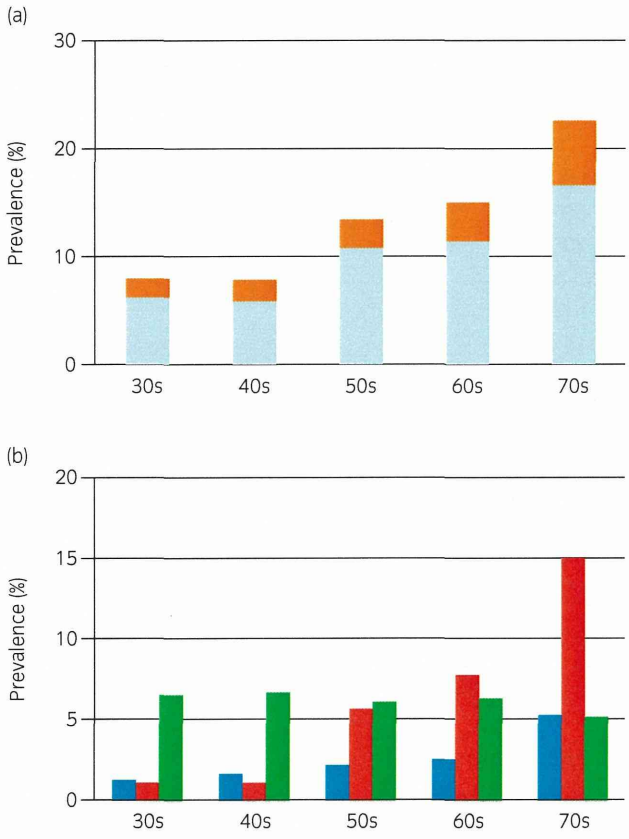

Fig. 1 (a) Prevalences of mild UI and moderate to severe UI stratified by age. (b) Prevalences of the three types of UI stratified by age. ■, moderate to severe UI; ■, mild UI; ■, SUI; ■, UUI; ■, PUI.

(Fig. 1a). Regarding the types of UI, 79 residents (2.5%) had SUI, 204 (6.3%) had UUI and 199 (6.2%) had PUI. A total of 15 residents (0.5%) had MUI. As shown in Figure 1b, the prevalences of SUI and UUI increased with aging, whereas the prevalence of PUI did not change.

The results of the analyses for correlates of each type of UI are shown in Tables 2 and 3. The univariate analyses showed that prostatic disease, age, malignant disease, anemia and hypertension were associated with SUI (Table 2). Among these variables, prostatic disease (OR 2.14), age (OR 1.29), anemia (OR 2.27) and malignant disease (OR 2.22) were independent correlates for SUI in the multivariate analyses (Table 3). Although both prostatic disease and malignant disease were independently correlated with SUI, the number of participants with prostate cancer was 22, which accounted for 10% of all participants with prostatic disease and 15% of all participants with malignant disease. Age, low back pain, diabetes, prostatic disease, hypertension, coronary artery disease, renal disease, malignant disease, sleeplessness, hepatic disease, dyslipidemia, BMI and alcohol intake were associated with UUI in the univariate analyses (Table 2). Among these variables, diabetes (OR 1.98), age (OR 1.92), low back pain (OR 1.74), alcohol intake (OR 1.84), renal disease (OR: 1.91) and prostatic disease (OR 1.48) remained statistically significant in the multivariate analyses (Table 3).

Unlike SUI and UUI, age was not associated with PUI. In contrast, asthma, prostatic disease, rhinosinusitis, sleeplessness, reflux esophagitis, anemia and BMI were associated with PUI in the univariate analyses (Table 2). Among these variables, asthma (OR 3.01), prostatic disease (OR 2.38), rhinosinusitis (OR 1.92), low back pain (OR 1.58) and BMI (OR 0.73) remained statistically significant in the multivariate analyses. Depression was another independent correlate for PUI (OR 3.41). Reflux esophagitis was marginally associated with PUI ($P = 0.09$) (Table 3). The lack of association between age and PUI was also observed after adjustment for the other independent correlates.

Discussion

The development of the three types of UI in men is deemed to be caused by different mechanisms. UUI, which is a component symptom of overactive bladder syndrome, is usually attributed to detrusor overactivity. SUI is induced by dysfunction of the urethral sphincter, which typically results from iatrogenic causes, such as prostatectomy. Meanwhile, the mechanism for the development of PUI is not well recognized. An earlier study by Stephenson *et al.* showed that most patients with PUI had normal urodynamic bladder function.[5] That study also found that half of the patients could not occlude their urethra voluntarily or "milk back" residual urine in the urethra into the bladder, suggesting contraction failure of the bulbocavernosus muscle. However, another study found that patients with PUI had normal reflex and activity of the bulbocavernosus muscle, as assessed by electromyography.[12] Despite the lack of an obvious mechanism, residual urine in the bulbar urethra has been attributed to PUI.[5]

The different mechanisms naturally suggest different prevalences and correlates of the three types of UI, and this was confirmed in the present study. Among the independent correlates of UUI, age, history of diabetes and low back pain had especially strong associations with UUI. Aging and diabetes have frequently been reported as risk factors for UI. Diabetes can induce various types of bladder dysfunctions, including detrusor overactivity,[13] and therefore the association of diabetes with UUI is reasonable. Low back pain is a novel correlate of UUI. Although this symptom can arise from various problems, age-related degenerative processes in the intervertebral disks and facet joints, spinal stenosis, and disk herniation are considered to be common causes.[14] These structural deformations of the spine might induce compression of the spinal cord or spinal roots, and potentially result in neurogenic bladder dysfunction, such as detrusor overactivity. Conversely, one longitudinal study

Table 2 Univariate analyses for correlates of SUI, UUI and PUI

	SUI		UUI		PUI	
	P-value	OR	*P*-value	OR	*P*-value	OR
Age	<0.001	1.44	<0.001	2.03	0.43	–
BMI	0.40	–	0.034	0.75	0.019	0.72
Alcohol	0.51	–	0.042	0.65	0.36	–
Smoking	0.40	–	0.66	–	0.58	–
Low back pain	0.39	–	<0.001	1.82	<0.001	1.74
Hypertension	0.044	1.62	<0.001	1.88	0.57	–
Rhinosinusitis	0.88	–	0.090	–	<0.001	2.16
Dyslipidemia	0.99	–	0.014	1.62	0.93	–
Prostatic disease	<0.001	3.25	<0.001	2.80	<0.001	2.80
Diabetes	0.48	–	<0.001	2.95	0.77	–
Gout	0.168	–	0.58	–	0.65	–
Sleeplessness	0.40	–	0.005	1.93	0.001	2.09
Hepatic disease	0.80	–	0.010	1.89	0.91	–
Coronary artery disease	0.40	–	0.001		0.050	1.68
Anemia	0.002	2.91	0.52	–	0.017	1.90
Malignant disease	<0.001	3.70	0.002	2.24	0.26	–
Atopic dermatitis	0.85	–	0.56	–	0.222	–
Asthma	0.28	–	0.47	–	<0.001	3.05
Depression	0.29	–	0.78	–	0.229	–
Reflux esophagitis	0.35	–	0.32	–	0.008	2.25
Renal disease	0.44	–	0.001	2.71	0.106	–
Stroke	0.27	–	0.79	–	0.82	–

showed that incontinence increased the risk of future back pain.[15] In any case, low back pain has a close relationship with UUI. PUI, as well as UUI, had an independent association with low back pain. The common symptom of low back pain would be better noted as an associated factor for various lower urinary tract symptoms including UUI and PUI. Similar to the case for UUI, aging was also a strong correlate of SUI. The other independent correlates of SUI were history of prostatic disease, malignant disease and anemia. Some previous studies have reported that men with prostatic disease have higher rates of UI.[16,17] Although it is well known that SUI is one of the most important complications after prostatectomy for prostatic diseases, especially prostate cancer, the present study population had a low prevalence of prostate cancer. Therefore, the association between SUI and prostatic disease and/or malignant disease in the present study would not be mainly attributable to radical prostatectomy.

The most striking observation in the present study was the lack of correlation between aging and PUI. The prevalence of PUI was found to remain constant at 5–6% throughout the generations, and the severity and frequency of this symptom were also not age dependent (data not shown). These observations suggest that this symptom does not arise through mechanical or functional dysfunction induced by aging. Furthermore, the independent correlates of PUI included uncommon parameters, such as asthma and rhinosinusitis; along with relatively common parameters, such as prostatic disease, sleeplessness and depression. There was also a marginal association between reflux esophagitis and PUI. Although some recent studies have suggested a relationship between overactive bladder and asthma,[18,19] asthma had no association with UUI, but was associated with PUI in the present study. It is recognized that asthma and rhinitis/rhinosinusitis have a strong correlation with each other.[20] The most accepted explanation for the interaction between the upper and lower airways is increased oral breathing and systemic response. In other words, impaired filtering in the nose of patients with rhinitis leads to mouth breathing, which can result in increased exposure of the lower airways to allergens. It is also known that asthmatic patients have a much greater risk of gastro-esophageal reflux disease-related symptoms and vice versa.[20] Gastro-esophageal reflux disease, including reflux esophagitis, could worsen asthma either by direct effects on airway responsiveness or through aspiration-induced inflammation, and the bronchoconstriction observed in asthma, as well as asthma medications, could induce gastro-esophageal reflux. Although these three diseases, asthma, rhinosinusitis and reflux esophagitis, have associations with one another and with allergy, the present

Table 3 Multivariate analyses for correlates of SUI, UUI and PUI

	SUI			UUI			PUI		
	P-value	OR	95% CI	*P*-value	OR	95% CI	*P*-value	OR	95% CI
Age	0.013	1.29	1.06–1.57	<0.001	1.92	1.64–2.24	–		
BMI	–			0.10			0.025	0.73	0.55–0.96
Alcohol	–			0.005	1.84	1.20–2.82	–		
Smoking	–			–			–		
Low back pain	–			<0.001	1.74	1.29–2.34	0.003	1.58	1.17–2.12
Hypertension	0.40			0.59			–		
Rhinosinusitis	–			0.12			0.001	1.92	1.33–2.77
Dyslipidemia	–			0.36			–		
Prostatic disease	0.009	2.14	1.21–3.77	0.045	1.48	1.01–2.18	<0.001	2.38	1.63–3.48
Diabetes	–			<0.001	1.98	1.36–2.90	–		
Gout	0.28			–			–		
Sleeplessness	–			0.33			0.013	1.86	1.14–3.04
Hepatic disease	–			0.24			–		
Coronary artery disease	–			0.42			0.33		
Anemia	0.022	2.27	1.13–4.57	–			0.26		
Malignant disease	0.025	2.22	1.10–4.45	0.53			–		
Atopic dermatitis	–			–			0.10		
Asthma	–			–			<0.001	3.01	1.79–5.06
Depression	–			–			0.024	3.41	1.17–9.90
Reflux esophagitis	–			–			0.09		
Renal disease	–			0.045	1.91	1.01–3.60	0.36		
Stroke	–			–			–		

study showed that each of these diseases was independently associated with PUI. As the mechanism for the development of PUI is completely unknown, as aforementioned, we cannot even speculate about the reasons why these diseases have relationships with PUI. Further investigations in this area are warranted in the future.

There have been a few epidemiological studies investigating the prevalence of PUI.[6,8,9] The previously reported results for the prevalence of PUI were quite variable ranging from 5.5 to 38.3%. Including the present study, the highly variable percentages might result from different questioning methods, interviews or self-reporting, and different races of the study populations. However, the most likely reason for the difference would be subtle differences in the formulation of questions indicating PUI. We used the ICIQ-SF, whereas others used a questionnaire based on the International Continence Society definition. Every question used in studies on the prevalence of PUI is validated for use, and the results obtained are significant. However, it is noteworthy that subtle differences in the formulation of questions can influence the outcomes.

The present study had several limitations. One is the ambiguity in the names of several diseases/conditions. For example, prostatic disease includes benign prostatic hyperplasia, prostate cancer and prostatitis, and we cannot distinguish concrete disease entities. Low back pain is also an ambiguous name for a symptom that can result from various diseases as described earlier. However, in actuality, many of the participants, who are amateurs in the medical field, did not know the exact disease causing their symptom of low back pain. Another limitation was the lack of data on bladder or bowel diseases, which can affect the function of the lower urinary tract. Despite these limitations, we believe that our observations provide some clues for the future solution of the mechanism of PUI.

Conflict of interest

None declared.

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