ORIGINAL ARTICLE

Is Alcohol Consumption Associated with Male Urinary Incontinence?

Andy H. LEE* and Fumi HIRAYAMA
School of Public Health, Curtin Health Innovation Research Institute, Curtin University of Technology, Perth, WA, Australia

Objectives: To investigate the association between alcohol consumption and urinary incontinence among Japanese men.

Methods: Seven hundred men aged 40–75 years were recruited from the community in middle and southern Japan. A validated food frequency questionnaire was administered face-to-face to obtain information on dietary intake and habitual alcohol consumption. Urinary incontinence status was ascertained using the International Consultation on Incontinence Questionnaire-Short Form.

Results: Among the 683 eligible male participants, 49 men (7.2%) experienced urine leakage for the past 2.6 years (standard deviation [SD] 1.9). Their prevalence of alcohol drinking (beer, sake, shochu, wine, whisky) was lower than others without the condition, even though the daily mean ethanol intakes were similar between the two groups, 31.8 g (SD 45.4) and 31.3 g (SD 41.9), respectively. Relative to non-drinkers, the adjusted odds of urinary incontinence were 0.43 (95% CI 0.19 to 0.96) for low ethanol intake, and up to 32 g per day and 0.53 (95% CI 0.22 to 1.28) for drinking, at most, one can (350 mL) of beer daily. However, higher levels of alcohol consumption had no significant benefit in reducing the incontinence risk.

Conclusion: The findings suggested an inverse association between urinary incontinence and low alcohol consumption particularly beer in middle-aged and older Japanese men.

Key words alcohol, beer, protective factor, urinary incontinence

1. INTRODUCTION

Urinary incontinence (UI) is a distressing condition and costly problem in middle-aged and older people worldwide.1 Besides age and gender, obesity and smoking are established risk factors.2–4 The prevalence of UI is also known to be affected by certain foods and beverages. A cross-sectional study in Finland reported that daily vegetable intake and butter consumption were associated with decreased lower urinary tract symptoms,5 while a higher intake of bread and chicken also reduced the risk of overactive bladder in women.2 A longitudinal study from Norway suggested that tea drinking could elevate the risk of female UI.6 In the literature, focus has been directed to female incontinence whereas investigation on incontinent males is scant.1

The effects of alcohol consumption on lower urinary tract symptoms in men remain unclear. According to a cross-sectional study in Italy, no association was evident between alcohol consumption and the risk of male UI.7 However, a large prospective cohort study of men in the United Kingdom found significant negative association between beer intake at baseline and subsequent onset of overactive bladder, with reduced risk at all levels of intake compared with those who seldom/never drank beer.8 This study aimed to ascertain the association between alcohol consumption and UI in middle-aged and older community-dwelling men. It formed part of an overall project on lifestyle factors for the prevention of this irritating condition.

2. METHODS

2.1. Subjects

Seven hundred community-dwelling men aged 40–75 years were recruited in middle and southern Japan between January 2006 and March 2007. This convenience sample of subjects was interviewed by the second author at shopping malls (9%) or when they attended community centers (18.6%) or undertook health checks at hospital clinics (72.4%). Subjects were excluded if they were non-residents or outside the desired age range. A total of 683 eligible participants were available for analysis after excluding 17 consented participants with missing demographic or lifestyle details. The purpose

*Correspondence: Andy H. Lee, PhD, School of Public Health, Curtin University of Technology, GPO Box U 1987, Perth, WA 6845, Australia. Tel: +61-8-92664180; Fax: +61-8-92662958. Email: Andy.Lee@curtin.edu.au

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and procedure were explained to each participant before obtaining their written consent. Confidentiality and the right to withdraw without prejudice were ensured and maintained throughout the study. The project protocol was approved by the Human Research Ethics Committee of the researchers’ institution (approval number HR 90/2005).

2.2. Instruments

A structured questionnaire incorporating the International Consultation on Incontinence Questionnaire—Short Form (ICIQ-SF)\textsuperscript{9} was administered face-to-face to assess UI status. The ICIQ-SF is a measure for evaluating the severity of urinary loss and condition-specific quality of life. The reliability, validity, and sensitivity of the instrument have been established,\textsuperscript{9,10} while linguistic validation of its Japanese translation was confirmed.\textsuperscript{11} It consisted of three components to determine frequency, quantity, and impact of urine leakage. Frequency was categorized into 0 (never), 1 (about once a week or less often), 2 (two or three times a week), 3 (about once a day), 4 (several times a day), and 5 (all the time). UI was considered present for those subjects within categories 1–5. Quantity was measured from 0 (none), 2 (a small amount), 4 (a moderate amount) to 6 (a large amount). The impact on daily life was scored on an incremental scale from 0 (not at all) to 10 (a great deal).

The circumstances of incontinence were recorded via a separate self-diagnostic item, with urge incontinence defined as “leaks before you can get to the toilet”, stress incontinence defined as either “leaks when you cough or sneeze” or “leaks when you are physically active or exercising”, while the combinations of these symptoms were regarded as mixed incontinence. Other incontinence referred to “leaks when you are asleep”, “when you have finished urinating and are dressed”, “for no obvious reason”, and “all the time”. Two questions were appended to the ICIQ-SF to find out how long the subject had the condition and whether treatment was sought.

Questions on habitual food and beverage consumption were taken from the Japan Public Health Center-based prospective study on cancer and cardiovascular disease.\textsuperscript{12} Validity and reproducibility of this food frequency questionnaire had been established for Japanese adults.\textsuperscript{13} The frequency of food intake was classified by nine categories ranging from “almost never” to “seven or more times per day”. Standard portion size consumed per meal was specified for each item, with amount expressed as small (50% smaller), medium, and large (50% larger) and quantified in terms of grams per day. Utensils and photographs of foods were shown to clarify size and amount whenever necessary. Daily total energy intake (kcal) was estimated by summing the energy intake across individual food items consumed.

For alcohol exposure measurement, participants drinking alcoholic beverages (sake, shochu, beer, whisky, and wine) at least once per month were asked to report the average quantity consumed for each beverage type and their frequency of intake in six levels: almost never, 1–3 days per month, 1–2 days per week, 3–4 days per week, 5–6 days per week, and almost daily. Participants were subsequently classified as either non-drinker (abstainer, ex-drinker) or drinker (at least once per month to daily). Both sake and shochu are popular Japanese traditional beverages. To evaluate alcohol intake, the ethanol amount in each beverage type was taken to be: 15% in sake, 25% in shochu, 5% in beer, 43% in whisky, and 14% in wine.\textsuperscript{14} For each alcoholic beverage, alcohol intake (g/day) was calculated by multiplying the average quantity of beverage taken (mL) per day and ethanol concentration (%), with the specific gravity of ethanol (0.792). The following conventional measurements of quantity were adopted: sake and shochu (180 mL/cup), whisky (30 mL/glass), wine (60 mL/glass), beer (350 mL/can). Total alcohol intake (g/day) was then the sum of the amounts from the five beverages. A person was regarded as a heavy drinker if his mean daily alcohol intake exceeded 60 g.\textsuperscript{15} The reference recall for dietary and alcohol consumption variables was set at 5 years before interview because estimation beyond 5 years would be difficult.

The structured questionnaire also collected demographic and lifestyle characteristics including age, weight, height, marital status, education level, location of residence, retirement status, smoking, as well as health conditions (e.g. hypertension, ischemic stroke, diabetes mellitus, depression and cancer). On average each interview took about 45 min to complete.

2.3. Statistical analysis

Descriptive statistics were first applied to summarize participant characteristics by UI status. Comparisons between groups were made using chi-square, $t$-, and Mann-Whitney tests. Unconditional logistic regression analyses were then performed to determine the association between total alcohol intake and the prevalence of UI. To further assess the effect of alcohol exposure, separate analyses were undertaken for the various types of alcoholic beverages. Both crude and adjusted odds ratios (OR) were obtained as estimates of relative risk, the latter accounted for the effects of age, body mass index (BMI), daily total energy intake, smoking status (never smoker, ex-smoker, or current smoker), education level (high school or below, or college or university) and presence of co-morbidity. These variables were considered potential confounders from the literature. Tests for interaction between significant variables were also conducted. All statistical analyses were undertaken using the SPSS package version 17 (SPSS Inc., Chicago, IL, USA).

3. RESULTS

According to the ICIQ-SF, the prevalence of UI was 7.2%. Urine leakage among the 49 incontinent subjects was typically “a small amount” (87.7%) and occurred once a week or less often (61.2%). The mean ICIQ score was 5.98 (standard deviation [SD] 2.68) and only a few considered the condition to have interfered with their
daily life to a great extent. The distribution of incontinence type was: urge (26.3%), stress (7.1%), mixed (2.4%), and other (14.28%). They had urine leakage for about 2.6 years (SD 1.9), but only two men consulted their physician for the incontinent problem.

Table 1 compares the characteristics of Japanese men with and without UI. Most of the participants were married (89%) and still employed (66%). Overall, about half of the participants had a health condition other than UI and 27% were current smokers. However, the incontinent men were about 3 years older on average and more likely to have high school or below education than their symptom-free counterparts. Their prevalence of alcohol drinking was lower across all five types of alcoholic beverages (beer being the most preferred beverage), even though the daily mean ethanol intakes were similar between the two groups. Among the drinkers, 11% (38%) men with UI and 115 (25%) without UI engaged in hazardous drinking (>60 g/day).

Table 2 shows the crude OR for alcohol consumption in relation to the risk of UI, and Tables 3–6 present the results from the multivariable logistic regressions. Analyses were not performed for wine and whisky due to their low number of drinkers. Relative to non-drinkers, the adjusted odds of UI decreased by approximately 50% for low ethanol intake up to 32 g per day or drinking at most one can (350 mL) of beer daily. However, higher levels of alcohol consumption produced no significant benefit in reducing the incontinence risk, while the drinking of sake and shochu had little association with the prevalence of UI. Moreover, the only other significant covariate was education level, but the interaction terms between education level and alcohol consumption variables were not statistically significant, with P-values ranging from 0.14 to 0.58.

### 4. DISCUSSION

This study investigated the relationship between UI and alcohol consumption in middle-aged and older Japanese men using validated instruments. The incontinent prevalence estimate of 7.2% was comparable with previous
reports for the Japanese population.\textsuperscript{16,17} Although a few subjects with UI perceived the condition as interfering with daily life, the low number seeking help is of concern. It is possible that the older men were either embarrassed or unaware that the condition is treatable. Education and regular assessment for lower urinary tract symptoms are needed as people become older.\textsuperscript{6}

The observed inverse association between male UI and low levels of habitual alcohol consumption, particularly beer, was consistent with a longitudinal study undertaken in the United Kingdom.\textsuperscript{8} Moreover, the interaction between education level and alcohol consumption was not significant, while demographic and other confounding variables have been controlled for, suggesting that effect modifications in the logistic regression models should be minimal. It has been suggested that the protective role of beer in the development of overactive bladder may be due to its non-alcoholic ingredients as well as the alcohol content.\textsuperscript{8} Some of these ingredients can affect the contraltral properties of the urethra and detrusor muscle.\textsuperscript{8} Experimental studies have shown that ethanol causes transient changes in circulating testosterone levels\textsuperscript{18} and oestrogens in men,\textsuperscript{19} and such sex hormones can relax the contractility of the detrusor muscle by suppressing calcium influx through the calcium channels of smooth muscle membrane.\textsuperscript{20} On the other hand, high levels of alcohol intake produced no significant benefit probably due to the diuretic effect when a large amount is consumed. Further research to understand the underlying biological mechanism is necessary.

Unlike men, a survey of Taiwanese women aged 20–59 years found the prevalence of UI increased with alcohol drinking, though the level of consumption was not quantified.\textsuperscript{21} However, a longitudinal study in the United Kingdom reported that beer consumption was not associated with the onset of overactive bladder and stress incontinence in women, which might be due to their low beer and alcohol consumption.\textsuperscript{2} This lack of association was also observed in two cross sectional population-based studies conducted in Norway and Italy.\textsuperscript{6,7} Sex differences in pathophysiological mechanisms for UI may also explain the contrasting results between men and women.

The present study found education level significantly associated with UI, with college or university graduates having lower odds of UI, with college or university graduates having lower odds of UI.\textsuperscript{6} This was also observed in two cross sectional population-based studies conducted in Norway and Italy.\textsuperscript{6,7} Sex differences in pathophysiological mechanisms for UI may also explain the contrasting results between men and women.

The present study found education level significantly associated with UI, with college or university graduates experiencing a reduced risk of UI. Educational attainment was also negatively correlated with female urine loss\textsuperscript{22} and inversely related to the prevalence of severe incontinence among women.\textsuperscript{23} However, no association between education and risk of UI emerged from a cross-sectional study in Italy.\textsuperscript{7} Caution must be taken as educational attainment may serve as a proxy for socioeconomic status which has some impact on UI.\textsuperscript{24} Several limitations should be taken into consideration when interpreting the findings. The retrospective cross-sectional study design posed a major limitation so that any cause-effect relationship could not be established.

\begin{table}[h]
\centering
\caption{Adjusted odds ratios for beer intake in relation to UI for Japanese men} 
\begin{tabular}{|l|l|l|l|}
\hline
Variable & Adjusted OR & 95\% CI & \(P\) \\
\hline
Beer (mL/day) & & & \\
0 & 1 & – & – \\
0.1–350 & 0.53 (0.22, 1.28) & 0.16 & \\
> 350 & 0.91 (0.42, 1.96) & 0.80 & \\
Smoking status & & & \\
Non smoker & 1 & – & – \\
Ex-smoker & 0.65 (0.27, 1.54) & 0.33 & \\
Current smoker & 1.13 (0.45, 2.87) & 0.80 & \\
Education & & & \\
High school or below & 1 & – & – \\
College or university & 0.42 (0.19, 0.93) & 0.03 & \\
Comorbidity & & & \\
Absence & 1 & – & – \\
Presence & 1.05 (0.58, 1.92) & 0.87 & \\
Age (years) & 1.04 (0.99, 1.09) & 0.09 & \\
BMI (kg/m\(^2\)) & 1.03 (0.94, 1.13) & 0.53 & \\
Energy intake (kcal/day) & 1.00 (0.99, 1.01) & 0.84 & \\
\hline
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\begin{table}[h]
\centering
\caption{Adjusted odds ratios for sake intake in relation to UI for Japanese men} 
\begin{tabular}{|l|l|l|l|}
\hline
Variable & Adjusted OR & 95\% CI & \(P\) \\
\hline
Sake & & & \\
Non drinker & 1 & – & – \\
Drinker & 0.72 (0.34, 1.50) & 0.38 & \\
Smoking status & & & \\
Non smoker & 1 & – & – \\
Ex-smoker & 0.71 (0.30, 1.66) & 0.42 & \\
Current smoker & 1.27 (0.50, 3.18) & 0.62 & \\
Education & & & \\
High school or below & 1 & – & – \\
College or university & 0.39 (0.18, 0.85) & 0.02 & \\
Comorbidity & & & \\
Absence & 1 & – & – \\
Presence & 1.04 (0.57, 1.90) & 0.91 & \\
Age (years) & 1.05 (1.00, 1.10) & 0.04 & \\
BMI (kg/m\(^2\)) & 1.03 (0.94, 1.13) & 0.58 & \\
Energy intake (kcal/day) & 1.00 (1.00, 1.01) & 0.62 & \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\caption{Adjusted odds ratios for shochu intake in relation to UI for Japanese men} 
\begin{tabular}{|l|l|l|l|}
\hline
Variable & Adjusted OR & 95\% CI & \(P\) \\
\hline
Shochu & & & \\
Non drinker & 1 & – & – \\
Drinker & 0.75 (0.34, 1.65) & 0.47 & \\
Smoking status & & & \\
Non smoker & 1 & – & – \\
Ex-smoker & 0.68 (0.29, 1.60) & 0.38 & \\
Current smoker & 1.25 (0.50, 3.16) & 0.63 & \\
Education & & & \\
High school or below & 1 & – & – \\
College or university & 0.39 (0.18, 0.86) & 0.02 & \\
Comorbidity & & & \\
Absence & 1 & – & – \\
Presence & 1.08 (0.59, 1.98) & 0.80 & \\
Age (years) & 1.04 (1.00, 1.09) & 0.07 & \\
BMI (kg/m\(^2\)) & 1.03 (0.94, 1.13) & 0.53 & \\
Energy intake (kcal/day) & 1.00 (1.00, 1.01) & 0.67 & \\
\hline
\end{tabular}
\end{table}
It is possible that some men with developing symptoms avoided alcohol because of its diuretic properties, even though the reference period for alcohol exposure was set at 5 years before interview while the subjects had urine leakage for the past 2.6 years (SD 1.9) on average.

Classification of UI status was based on self-report via the ICIQ-SF rather than objective measures of urine loss, and seasonal alterations were not accounted for. Nevertheless, it is now recognized that the use of psychometrically robust self completion questionnaires is a valid approach for assessing UI. The ICIQ-SF has good measurement properties and encompasses all aspects of incontinence. Moreover, face-to-face interviews were conducted to help the recall of alcohol consumption and to avoid misinterpretation of the questions.

In this study, the second author conducted all data collection thus eliminating the possibility of inter-interviewer bias. However, selection bias could not be ignored as a result of the convenience sample which consisted of voluntary participants. Nevertheless, all participants resided in the community and should still be representative of the underlying population. Also, community-based randomized sampling would be difficult to implement with high refusal rate expected in practice.

Another limitation concerns residual confounding which might mediate the observed findings. Although established confounders and certain co-morbidities have been accounted for in the multivariable analyses, important clinical information was lacking, such as the use of diuretic drugs and benign prostatic hyperplasia which would impact incontinence, especially after therapeutic treatment or prostatectomy. Information bias, however, was unlikely because the effect of alcohol consumption has not been established in Japan. Indeed, none of the participants reported any change in alcohol drinking habit within the past 5 years.

In conclusion, an inverse association was observed between UI and low levels of alcohol consumption in middle-aged and older Japanese men. In view of the Japanese government recommendation of no more than 20 g of alcohol intake per day, the evidence should be regarded as preliminary and further replications in other countries are needed. Population-based prospective cohort studies and experimental research are recommended to confirm the potential beneficial effect of beer for the prevention of this distressing condition.

**Disclosure**

None.

**REFERENCES**


