

Habitual alcohol consumers' understanding of "moderate drinking": A cross-sectional study in Japan

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ABSTRACT

The Healthy Japan 21 project launched in FY2000 advocated dissemination of the knowledge that intake of about 20 g of pure alcohol per day represents a "moderate" drinking level. The aim of the present study was to explore various points that have been debated with regard to "moderate drinking". An Internet-based questionnaire survey was administered to normal adults who habitually drank alcohol one or more days a week, and we studied the amount of alcohol consumed by those who responded that they did moderately without fail. Gender-based logistic regression analysis was conducted to examine the relationship between "non-moderate drinking" on the one hand and drinking frequency, marital status, and lifestyle habits on the other. Responses were obtained from 1088 persons (548 men and 540 women) (response rate: 57.6%), of whom 31.9% of the men and 53.6% of the women responded that they drank moderately without fail. Among these drinkers, 54.6% of the men and 78.2% of the women in reality drank moderately. For both men and women, the odds ratio (OR) for "non-moderate drinking" increased as drinking frequency increased. When "1 to 2 days a week" was taken as the reference, the OR values for "every day" were 8.69 (95% confidence interval [CI]: 4.98 - 15.14) for men and 7.35 (95% CI: 4.20 - 12.88) for women. Furthermore, significantly higher ORs were observed among both single men and single women, and among male smokers. The present study has clarified that dissemination of knowledge about "moderate drinking" has not been effective. Encouraging more awareness of

the importance of drinking frequency is also considered necessary.

Keywords: Moderate Drinking; Amount of Alcohol Consumption; Drinking Frequency; Healthy Japan 21

1. INTRODUCTION

According to the report on alcohol and health issued by the World Health Organization in 2011, harmful use of alcohol is one of the world's leading health risks, and is a causal factor in more than 60 major types of disease and injury, resulting in approximately 2.5 million deaths each year [1]. It has also been pointed out that, overall, 4% of the global burden of disease is attributable to alcohol, accounting for about as much death and disability globally as tobacco and hypertension [2]. On the other hand, a perceived beneficial impact of alcohol has also been described that for ischemic heart disease, ischemic stroke and diabetes mellitus beneficial effects were observed for patterns of "light to moderate" drinking in the absence of binge drinking [3].

In Japan, alcohol was one of the nine target areas included in the "National Health Promotion Movement in the 21st Century (Healthy Japan 21)" launched in FY2000 [4]. Its basic policy was to promote 1) early detection and treatment of heavy drinking, 2) prevention of alcohol-drinking by minors, and 3) dissemination of knowledge about alcohol and health [5]. With regard to point 3), on the basis of a study that had targeted Japanese men aged between 40 and 59 years [6] and a meta-analysis of surveys that had targeted Westerners [7], a drinking level considered to be "moderate" was set as an average daily intake of about 20 g of pure alcohol (with a smaller amount for women) [8].

Moderate levels of alcohol consumption have also been defined numerically in various other countries in the form of recommended maximum daily or weekly levels [9]. However, a question arises as to whether it is so easy to limit alcohol intake to only a moderate amount, considering alcohol's inhibition-reducing effects and ability to cause dependence. Furthermore, a study of "moderate drinking" conducted among outpatients at a single urban medical center in Boston, USA, found that a substantial number of medical outpatients cited health benefits as a motivation for drinking alcohol, although few recognized the health risks [10].

Against this background, using a questionnaire survey targeting normal adults who habitually drank alcohol, the present study was conducted to explore the debatable issues related to "moderate drinking" as defined by Healthy Japan 21 by 1) investigating the actual drinking behavior of the respondents and 2) considering the factors that might make it difficult for individuals to drink in moderation.

2. MATERIALS AND METHODS

2.1. Subjects and Internet-Based Cross-Sectional Survey

In this study, the task of conducting an Internet-based survey was entrusted to NTT Resonant Inc., which carried out the survey between August 31 and September 5, 2009. Out of 12,948 persons (men: 5777, women: 7171) selected randomly from approximately 591,000 registered monitor members of goo Research service of the company (Tokyo, <http://research.goo.ne.jp/> [in Japanese]) nationwide, a total of 1889 persons (men: 916, women: 973) were chosen as subjects for the present study on the basis of the following inclusion criteria: agreeing to participate in the present survey, habitually consuming alcohol one or more days a week, and having not been told by a doctor to give up drinking because of a disease or other condition. If several members of a family were registered members, the questionnaire was distributed to only one member of each family.

The following ethical considerations were taken into account: 1) although participation was voluntary, informed consent was required from each subject; 2) data collection and statistical analysis were performed by different researchers so that the person performing the analysis did not have access to the subjects' personal data; and 3) collected data were coded to protect personal information and maintain confidentiality.

2.2. Questionnaire Items

The questionnaire asked the subjects for information on their gender, age, marital status, frequency of alcohol consumption per week, amount of alcohol consumed per

drinking day, smoking/exercise habits, regularity of dietary habits, and sleep duration. Questions regarding drinking frequency and amount of alcohol consumed were based on the Report of the National Health and Nutrition Examination Survey [11]. A guidance note was also included, stating that consumption of 180 ml of *seishu* [4] (22 g of pure alcohol [8]) was roughly equivalent to 500 ml of beer, 100 ml of *shouchuu* [4] (25 degrees), 60 ml of whisky, or 240 ml of wine. Furthermore, with regard to what was considered a moderate range of drinking, subjects had to answer a question using response options of "I do so without fail/fairly well/not so well/not at all". This question was asked after questions about the amount of alcohol consumed, so that subjects were unable to go back and change their initial responses regarding the amount of alcohol they consumed. Subjects who responded "often" or "sometimes" to the question on whether they made a conscious effort to exercise were classified as "with an exercise habit", and those who responded "seldom" or "never" were classified as "without an exercise habit". With regard to regularity of dietary habits, the answer options to the question on whether the respondent generally ate three meals a day were "Yes", "No", and "Unsure".

2.3. Statistical Analyses

Our statistical analyses first examined gender-based differences in terms of age groups, marital status, and lifestyle habits other than alcohol-drinking. Second, the relationship between drinking frequency and the amount of alcohol consumed was investigated by gender. Third, the amount of alcohol consumed for those who reported that they were able to practice moderate drinking "without fail" were investigated by gender and by age group. χ^2 test was used to assess the significance of differences in the results. Finally, the amount of alcohol consumed per drinking day was converted to the amount of *seishu*; a daily intake of more than 180 ml (which is the "moderate" drinking level defined in Healthy Japan 21 [8]) was defined as "non-moderate drinking". Using this as the dependent variable, we conducted logistic regression analysis by gender, using age, marital status, smoking/exercise habits, dietary habits, sleep duration and drinking frequency as the explanatory variables. Responses of "I do not know" for the amount of alcohol consumed and "Unsure" for regularity of dietary habits were excluded from these analyses.

The significance level was set at 5%, and the IBM SPSS Statistics 20 software package was used for statistical analysis.

3. RESULTS

Responses to this survey were obtained from 1088

persons (men: 548, women: 540) out of 1889 persons to whom the questionnaires were distributed (response rate: 57.6%).

Table 1 shows the age groups, marital status, and lifestyle habits other than alcohol-drinking of the respondents by gender. Significant gender differences were found for all the items except age group and sleep duration. The proportion of smokers was 32.7% among men and 17.0% among women. The average age (standard deviation) was 45.3 (14.5) years for men and 44.0 (13.6) years for women, no significant difference being observed (Mann-Whitney U test; $p = 0.191$).

Table 2 shows the relationship between drinking fre-

Table 1. The age groups, marital status, and lifestyle habits other than alcoholic-drinking of the respondents by gender.

	Men	Women	
	(N = 548)	(N = 540)	p
Age			0.995
20 - 29	19.7	20.4	
30- 39	20.1	20.4	
40 - 49	20.1	20.4	
50 -59	20.1	19.6	
≥60 yr	20.1	19.3	
Marital status			0.028**
With spouse	63.3	69.6	
Without spouse	36.7	30.4	
Smoking			<0.001**
Non-smoker	47.3	72.0	
Ex-smoker	20.1	10.9	
Smoker	32.7	17.0	
Exercise habit			0.021**
With	54.0	47.0	
Without	46.0	53.0	
Dietary habit*			0.032**
Regular	74.3	80.0	
Irregular	25.7	20.0	
Sleep duration			0.973
<6 h	44.0	44.6	
≥6 h, <8 h	52.7	52.2	
≥8 h/day	3.3	3.1	(%)

*A total of 84 persons who reported "Unsure" was excluded from the analysis for this item. ** χ^2 test and its p-value were found to be significant at 5% level.

quency and the amount of alcohol consumed for the respondents by gender. With regard to drinking frequency, more subjects reported "1 to 2 days a week" or "every day" than "3 to 4 days a week" or "5 to 6 days a week". Significant gender differences were found in the amount of alcohol consumed, 44.4% and 9.2% of men reporting that they drank "less than 180 ml" and "540 ml or more" per drinking day, respectively, while the corresponding percentages for women were 68.4% and 3.0%, respectively (all on a *seishu*-converted basis). For both men and women, significant differences were found in the amount of alcohol consumed in relation to drinking frequency, and the percentage that reported consuming less than 180 ml of alcohol was lower among subjects with a higher weekly drinking frequency.

Table 3 shows the percentage component by gender and by age group for the amount of alcohol consumed for subjects who reported "I am able to drink moderately without fail". The proportions of subjects who responded in this way (after excluding those who reported "I do not know" for the amount of alcohol consumed) were 31.9% (174 persons out of 545) for men and 53.6% (285 persons out of 532) for women. Among them, 54.6% of the men and 78.2% of the women reported drinking less than 180 ml of alcohol per drinking day (both on a *seishu*-converted basis), the gender difference being significant. There was no significant difference on the basis of age group for the amount of alcohol consumed, either for men or for women.

Table 4 shows the results of logistic regression analysis by gender, taking "non-moderate drinking" as the dependent variable. For age group, no significant odds ratio (OR) was found among men, while a significant decrease in OR was noted among women aged 60 years and older when women in their 20s were used as the reference. When "with spouse" was taken as the reference, a significant increase in OR was seen for respondents who were "without spouse" among both men and women. Among male smokers, a significant increase in OR was noted when "non-smoker" was taken as the reference. With regard to drinking frequency, the OR values increased for both men and women as the drinking frequencies per week increased. When "1 to 2 days a week" was taken as the reference, the OR values for "every day" were 8.69 (95% confidence interval [CI]: 4.98 - 15.14) for men and 7.35 (95% CI: 4.20 - 12.88) for women.

4. DISCUSSION

This study was conducted among normal adults who consumed alcohol one or more days a week. Those who reported "I am able to drink moderately without fail" accounted for about 30% of the men and about 50% of the women. Among them, no more than about 55% and

Table 2. The relationship between drinking frequency and the amount of alcohol consumed for the respondents by gender.

Drinking frequency	The amount of alcohol consumed per drinking day*					p
	N	<180	≥180, <360	≥360, <540	≥540	
Men						
1 - 2	175	69.1	16.0	9.1	5.7] <0.001**
3 - 4	84	46.4	34.5	14.3	4.8	
5 - 6	93	37.6	32.3	21.5	8.6	
Every day/week	193	24.4	40.4	20.7	14.5	
Total	545	44.4	30.3	16.1	9.2] <0.001**
Women						
1 - 2	239	82.8	11.7	2.1	3.3] <0.001**
3 - 4	98	71.4	20.4	7.1	1.0	
5 - 6	68	57.4	36.8	4.4	1.5	
Every day/week	127	44.9	35.4	15.0	4.7	
Total	532	68.4	22.2	6.4	3.0 (%)] <0.001**

*Responses of "I do not know" were excluded from these analyses. The amount of alcohol consumed was converted to *seishu* (unit: ml). ** χ^2 test and its p-value were found to be significant at 5% level.

Table 3. The percentage component by gender and by age group for the amount of alcohol consumed for subjects who reported "I am able to drink moderately without fail".

Age group	The amount of alcohol consumed per drinking day*					p
	N	<180	≥180, <360	≥360, <540	≥540	
Men						
20 - 29	33	54.5	21.2	21.2	3.0] 0.109
30 - 39	29	51.7	34.5	6.9	6.9	
40 - 49	33	72.7	12.1	6.1	9.1	
50 - 59	31	58.1	19.4	16.1	6.5	
≥60 yr	48	41.7	41.7	14.6	2.1	
Total	174	54.6	27.0	13.2	5.2] <0.001**
Women						
20 - 29	51	78.4	13.7	5.9	2.0] 0.371
30 - 39	47	70.2	25.5	2.1	2.1	
40 - 49	59	72.9	18.6	8.5	-	
50 - 59	58	81.0	10.3	6.9	1.7	
≥60 yr	70	85.7	12.9	1.4	-	
Total	285	78.2	15.8	4.9	1.1 (%)] 0.371

*Responses of "I do not know" were excluded from these analyses. The amount of alcohol consumed was converted to *seishu* (unit: ml). ** χ^2 test and its p-value were found to be significant at 5% level.

Table 4. Logistic regression analysis by gender, taking “non-moderate drinking” as the dependent variable*.

Explanatory variables	Men				Women			
	N	AOR	95% CI	p	N	AOR	95% CI	p
Age								
20 - 29	97	1.00	Reference		93	1.00	Reference	
30 - 39	96	1.17	0.61 - 2.25	0.645	97	1.27	0.66 - 2.46	0.479
40 - 49	101	0.89	0.46 - 1.75	0.736	105	0.81	0.41 - 1.62	0.554
50 - 59	102	1.15	0.57 - 2.32	0.703	96	0.68	0.33 - 1.38	0.283
≥60 yr	107	1.51	0.71 - 3.23	0.288	100	0.46	0.22 - 0.99	0.046**
Marital status								
With spouse	327	1.00	Reference		352	1.00	Reference	
Without spouse	176	1.92	1.16 - 3.18	0.011**	139	1.90	1.17 - 3.10	0.010**
Smoking								
Non-smoker	240	1.00	Reference		357	1.00	Reference	
Ex-smoker	102	0.95	0.55 - 1.61	0.836	51	1.85	0.94 - 3.64	0.075
Smoker	161	1.83	1.14 - 2.93	0.013**	83	1.30	0.75 - 2.26	0.356
Exercise habit								
With	278	1.00	Reference		236	1.00	Reference	
Without	225	0.88	0.58 - 1.32	0.521	255	0.95	0.62 - 1.46	0.804
Dietary habit								
Regular	375	1.00	Reference		392	1.00	Reference	
Irregular	128	1.63	1.00 - 2.65	0.051	99	1.03	0.61 - 1.76	0.905
Sleep duration								
≥6 h, <8 h	270	1.00	Reference		262	1.00	Reference	
<6 h	215	0.88	0.58 - 1.32	0.535	215	1.39	0.90 - 2.13	0.135
≥8 h/day	18	1.60	0.50 - 5.09	0.427	14	0.29	0.06 - 1.45	0.132
Drinking frequency								
1 - 2	159	1.00	Reference		217	1.00	Reference	
3 - 4	79	3.17	1.76 - 5.72	<0.001**	92	1.87	1.03 - 3.42	0.041**
5 - 6	84	3.57	1.98 - 6.45	<0.001**	66	4.75	2.51 - 8.98	<0.001**
Every day /week	181	8.69	4.98 - 15.14	<0.001**	116	7.35	4.20 - 12.88	<0.001**

*Non-moderate drinking: the amount of alcohol consumed per drinking day was more than 180ml on a *seishu*-converted basis. All the items included in this table were input as covariates in each logistic model. Responses of “I do not know” for the amount of alcohol consumed and “Unsure” for regularity of dietary habits were excluded from these analyses. **Logistic regression analysis and its p-value were found to be significant at 5% level. AOR: adjusted odds ratio; CI: confidence interval.

80% of the men and women, respectively, actually had an alcohol consumption level within the limits of “moderate drinking” defined by Healthy Japan 21 (less than 180 ml per day on a *seishu*-converted basis). In other words, attempts to disseminate knowledge about what constitutes “moderate drinking” have not been effective

in the 10 years since the start of the “Healthy Japan 21” project. This raises an important issue when considering how knowledge of alcohol’s relationship with health should be disseminated. In a survey of warnings about the consumption of alcoholic beverages conducted in Japan in 2008, the rate of awareness about messages to

encourage moderate drinking was as low as 45.5% [12]. It was noted that this may be because message regarding moderation tend to lack details or specifics, and this ambiguity makes them difficult to understand. Persons who drink alcohol habitually are likely to assume that a moderate amount is an amount that does not cause any specific inconvenience to them in daily life.

Healthy Japan 21 defines a person as a heavy drinker with an alcohol problem if he/she drinks about 60 g of pure alcohol (540 ml on a *seishu*-converted basis) per day [8]. Among the subjects of we surveyed who reported drinking every day, those with an alcohol consumption categorized as “heavy” accounted for 14.5% of men and 4.7% of women. Among those who reported a drinking frequency of 5 to 6 days a week, these proportions dropped to 8.6% and 1.5%, respectively (**Table 2**). Furthermore, among those with higher drinking frequencies, the proportion of subjects consuming less than 180 ml alcohol was smaller. This suggests the importance of advice to abstain from drinking on some days of the week, which should also be included in knowledge about what constitutes “moderate drinking”. According to the results of the National Health and Nutrition Examination Survey conducted in 2009, the percentage of heavy alcohol drinkers among individuals who drank alcohol every day was 12.7% (151 persons out of 1191) for men and 6.2% (16 persons out of 260) for women [11]. The figures obtained in this study are similar.

According to the results of logistic regression analysis, the OR value for “non-moderate drinking” increased among both men and women as the frequency of drinking increased. In other words, the risk of heavy drinking increases for persons with a greater drinking frequency, and warnings regarding not only the amount of alcohol consumed but also drinking frequency should be included in knowledge about “moderate drinking”. Harding and Stockley stated that one of the potential problems related to recommendations about alcohol consumption is that in many cultures, people who drink regularly tend to drink too much, and light drinkers tend not to drink regularly [9], a situation that reflects the present results. On the other hand, no statistically significant increase in OR was observed for age group, among either men or women. From this finding, despite the cross-sectional design of our study, we infer that the amount of alcohol consumed by individuals who drink alcohol habitually does not necessarily increase with time.

In a review of studies of the effect of marriage on alcohol intake, “reduced alcohol consumption triggered by the transition to marriage” is mentioned as the first of such marriage-related processes [13]. In the present study, compared with subjects who were “with spouse”, there was a significant increase in the OR for “non-moderate drinking” among those “without spouse” for both men

and women, suggesting that not having a marriage partner is a factor potentially inhibiting “moderate drinking” regardless of gender. A statistically significant increase in OR for “non-moderate drinking” was seen among male smokers in comparison with male non-smokers; among women, no significant OR was observed. However, the prevalence of smoking among female subjects was 17.0% (**Table 1**), higher than the rate of 10.9% among the general population of women in Japan (2009 survey data) [5]. This suggests that smoking and drinking tend to be linked. It is therefore essential to enforce anti-smoking measures concurrently with a campaign to promote “moderate drinking”. Furthermore, a study of lifestyles conducted among 519 Japanese male subjects aged 30 to 65 years noted that improper smoking was judged to be associated with improper drinking [14], thus supporting the results of this study.

The present study had some limitations. First, the response rate was not very high (57.6%). According to the results of the National Health and Nutrition Examination Survey of 2009, the proportions of persons whose alcohol consumption was “less than 180 ml” and “540 ml or more” (both on a *seishu*-converted basis) per drinking day among those who drank alcohol one or more days a week (men: 2116, women: 885) were 28.7% and 12.7% for men and 52.2% and 4.5% for women, respectively [11]. In comparison, this survey included a larger number of light drinkers. Second, other factors related to drinking behavior such as age at starting to drink [15], occupation, economic status, and mental health status were not included in this survey, so their effects cannot be discussed. Third, as the subjects were asked to report their alcohol consumption on a *seishu*-converted basis, some exposure misclassification may have occurred for those who drank alcoholic beverages other than *seishu*. However, this misclassification was assumed to have been non-differential.

As discussed above, the results of this study have clarified that attempts to disseminate knowledge about what constitutes “moderate drinking” have not been effective. Harding and Stockley have also suggested that advices on the beneficial effects of moderate consumption are not useful to populations at high risk of alcohol abuse [9]. Therefore, providing knowledge about “moderate drinking” habits alone would never be sufficient. Information on the possible adverse effects of alcohol on health unless “moderate drinking” is practiced should also be widely provided. Recent studies among Japanese subjects have explicitly defined the relationship between the amount of alcohol consumed and the incidence of cancer overall [16] as well as colorectal cancer [17] and primary liver cancer [18], and have also shown that the amount of alcohol consumed contributes to hypertension [19] and stroke and coronary heart disease [20]. These

negative impacts of alcohol on health should be given greater emphasis.

5. CONCLUSIONS

In conclusion, using an Internet-based questionnaire survey of normal adults who drank alcohol habitually, the present study examined some debatable issues related to “moderate drinking” as advocated in Healthy Japan 21. The following are the key implications of the study findings: 1) dissemination of knowledge that “moderate drinking” can be regarded as intake of about 20 g of alcohol per day has clearly not been effective; 2) warnings about drinking frequency need to be included when attempting to disseminate knowledge about “moderate drinking”; and 3) smoking and being without a spouse may be factors that make it more difficult to drink in moderation. It is therefore expected that efforts will be made to promote effective dissemination of knowledge about “moderate drinking” that also includes details of the harmfulness of alcohol.

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