

## Obesity, type 2 diabetes, age, and female gender: significant risk factors in the development of alcoholic liver cirrhosis

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### Abstract

**Background** Recent epidemiological studies show that alcoholic liver cirrhosis (ALC) continues to increase in spite of a gradual decrease in the alcohol intake beyond 1999, indicating that there are other risk factors for the development of ALC.

**Methods** A nationwide survey of liver cirrhosis (LC) was undertaken by asking major hospital institutions to provide the number of patients with LC admitted between 2007 and 2008 together with their etiologic findings including the daily intake of alcohol, period of drinking, and other relevant demographic measurements.

**Results** The intake of alcohol in female ALC patients was lower together with a shorter drinking period versus male patients. The prevalence of diabetes mellitus (DM) in ALC patients was higher in habitual drinkers (<110 g/day) than in heavy drinkers ( $\geq 110$  g/day), 49.5 versus 20.3%, respectively ( $P < 0.001$ ). In male ALC patients, the prevalence of DM was higher in habitual drinkers, 55.2 versus 20.6% for the female gender ( $P < 0.001$ ). The same tendency was seen in patients with a body mass index  $\geq 25$ . The prevalence of obesity was higher in habitual drinkers than in heavy drinkers, 49.7 versus 31.1%, respectively.

More than 90% of the male habitual drinkers either had DM or were obese, whereas less than half of the female habitual drinkers had a concomitant complication. More than 70% of the male ALC patients were over 60 years.

**Conclusion** Obesity, DM, age, and female gender appear to be additional significant risk factors for ALC. Our impression is that these additional risk factors might help to identify alcoholic patients who may progress to ALC even without excessive alcohol intake.

**Keywords** Alcoholic liver cirrhosis · Obesity · Diabetes mellitus · Age · Female gender

### Introduction

Four national surveys on alcoholic liver disease (ALD) in Japan were carried out by the Japanese ALD study groups, by the Takeuchi group in 1978 and 1985 [1], by the Takada group in 1992 [2], and by the Ishii group in 2003 [3]. These four studies reported that the prevalence of ALD increased in parallel with an increase in the alcoholic beverage intake, and that the rise in ALD was one major factor contributing to the increased prevalence of liver cirrhosis (LC) [3]. It was reported that there was a close dose–effect relationship between alcohol intake and the risk of ALD [4]. Likewise, in other countries, mortality due to LC closely correlates with the amount of alcohol consumed. However, alcoholic patients have discernible differences in their susceptibility to develop cirrhosis, and approximately 20% of the chronic alcoholics develop LC [4, 5]. Furthermore, alcoholic liver cirrhosis (ALC) continues to increase in spite of a gradual decrease in the alcohol intake beyond 1999; the amount of ethanol consumption in 2009 was 90% of the peak level in 1999 (Japan National Tax

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Agency, 2011), indicating that there are other risk factors for the development of ALC.

Several factors are thought to increase the risk of ALC. Non-alcoholic steatohepatitis (NASH) is a cause of liver inflammation, which immunohistologically resembles patients with alcoholic hepatitis [6]. However, the disorder may ultimately lead to cirrhosis. Further, it is estimated that obesity-related cirrhosis is present in some obese patients at autopsy [7]. In patients with NASH, age, obesity, and diabetes mellitus (DM) are independent predictors of the degree of fibrosis [8]. Therefore, these factors may be involved in the progression of ALC in addition to NASH. Indeed, it was reported that in obese individuals, weight was associated with both cirrhosis and liver fibrosis in alcoholic patients [9].

Epidemiologic evidence convincingly indicates that the adverse consequences of alcohol consumption, including severe liver disease like ALC, may develop quickly and require a lower level of alcohol exposure in the female gender than in the male gender [10, 11]. This is to say that at any given level of alcohol intake, women are at a higher risk of developing liver disease as compared with men. However, it remains unclear why the susceptibility to ALD is greater in women than in men. This investigation aimed to better understand if gender, excess weight, and DM were additional risk factors for ALC.

## Subjects and methods

### Survey of patients

A nationwide survey of liver cirrhosis (LC) was undertaken by asking major hospital institutions to provide the number of patients with LC admitted between 2007 and 2008 together with their etiologic findings including the daily intake of alcohol, period of drinking, and other relevant demographic variables.

The criteria for LC and the definition of the etiology applied in this study are according to Michitaka et al. [12], and are summarized in Table 1. The final diagnosis of LC and the determination of etiology were done in each of the participating institution. Using the diagnostic criteria for ALD according to Takada [2], the etiological factors for LC were divided into four categories: (1) alcohol alone; (2) a combination of alcohol and viral infection; (3) possibly caused by a viral infection alone; and (4) other causes. Accordingly, the questionnaires recorded the number of patients in each of the aforementioned etiological groups.

Regarding ALC, we also factored age, body weight, height, gender, daily alcohol intake in grams of pure ethanol per day, length of habitual drinking, alcoholism (time from the beginning of excessive intake), prevalence of DM,

**Table 1** Criteria for the diagnosis of liver cirrhosis and classification of etiology

Criteria for classification of etiology
Hepatitis B virus (HBV): positive for HBs-Ag and anti-HBc-Ab with high titer
Hepatitis C virus (HCV): positive for anti-HCV-Ab and HCV-RNA
HBV + HCV
Alcohol: criteria proposed by the Japanese Study Group of Alcoholic Liver Disease (Table 2)
Primary biliary cirrhosis
Other biliary cirrhosis (primary sclerosing cholangitis, etc.)
Autoimmune hepatitis
Metabolic diseases (Wilson disease, hemochromatosis, etc.)
Congestive disease
Parasites
Other known etiology
Nonalcoholic steatohepatitis (NASH)
Unknown etiology
Autopsy, laparoscopy, or abdominal imaging (left lobe hypertrophy with splenomegaly, nodular changes in liver surface) and laboratory findings (low platelet count, albumin, and/or prolonged prothrombin time) compatible with liver cirrhosis. Also, clinically diagnosed in patients with clinical findings of esophageal varices, ascites, or hepatic encephalopathy. Patients diagnosed solely based on histological liver biopsy findings are excluded

hepatocellular carcinoma (HCC), ascites, jaundice, esophageal varices, and body mass index (BMI). Our protocol was reviewed by the Ethics Committees of Keio University School of Medicine. We defined habitual drinkers as those whose daily alcohol intake was less than 110 g/day, and heavy drinkers as those whose daily alcohol intake was more than 110 g/day.

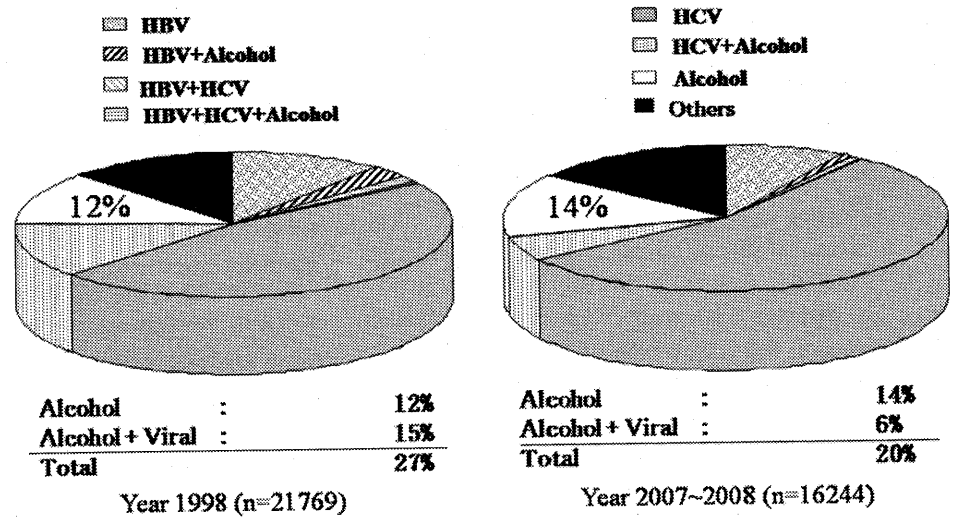
### Statistics

For differences between mean of unpaired data, one-way analysis of variance and Student's *t* test were applied. Differences in frequency were calculated by the Chi-square test. *P* values < 0.05 were considered significant.

## Results

Of the 16,224 patients with LC presented in Fig. 1, the analyses of our nationwide survey showed the following causes for LC: hepatitis C virus (HCV), 9,811 cases (60.5%); hepatitis B virus (HBV), 1,530 cases (9.4%); HCV + HBV, 149 cases (0.9%); alcohol (without any markers of hepatitis virus), 2,220 cases (13.7%); and other causes, 2,514 cases (15.5%). Regarding LC with any marker of hepatitis virus, 1,001 cases (6.2%) were habitual

**Fig. 1** The etiology of liver cirrhosis (LC). The ratio of alcoholic LC (ALC) without markers of hepatitis virus shows a slight increase, while ALC with the markers of hepatitis virus shows a marked decrease



drinkers (the daily alcohol intake was more than 60 g/day). Therefore, a total of 3,221 cases (19.9%) had ALC.

Among the 2,070 ALC patients without any marker of hepatitis virus whose drinking behavior and data on their physical conditions were available, the daily alcohol intake in female patients was less than the level in male patients, 115 versus 126 g/day (Table 2). Similarly, the period of habitual drinking in female patients was shorter than that in male patients, 25.8 versus 34.3 years. The ratio of female patients whose daily alcohol intake was less than 110 g/day (the so-called habitual drinkers) was higher than the level in male patients. Figure 2 shows the number of ALC patients (panel A), and the daily alcohol intake (panel B) in each age and gender band. The peak age for male patients was in the 60–69 year age range, while the peak for female patients was in the 50–59 year age range. More than 70% of the male patients were over 60 years, while only 40% of the female patients were over 60 years ( $P < 0.001$ ). Age and the daily intake of alcohol were inversely related.

Figure 3a shows the number of ALC patients and their daily intake (less or more than 110 g/day pure ethanol) with or without DM. The prevalence of DM was significantly higher in habitual drinkers (less than 110 g/day) than that in

the so-called heavy drinkers whose daily alcohol intake was more than 110 g/day, 49.5% (426 of 860) versus 20.3% (246 of 1,210), with  $P < 0.001$ . In male ALC patients, the prevalence of DM was higher in habitual drinkers, 55.2% (397 of 719) for the male gender versus 20.6% (29 of 141) for the female gender ( $P < 0.001$ ). Furthermore, 62.9% (397 of 631) of the cases were habitual drinkers in male ALC patients who had DM, while 26.6% (322 of 1,212) of the cases in male ALC patients were without DM. Such relationship was not observed in female ALC patients.

As shown in Fig. 3b, the trend described above for DM was also observed for obesity (BMI  $\geq 25$ ). The prevalence of obesity was significantly higher in habitual drinkers (less than 110 g/day) than in heavy drinkers (more than 110 g/day), 49.7% (427 of 860) versus 31.1% (376 of 1,210), with  $P < 0.001$ . Furthermore, 53.4% (384 of 726) of the cases were habitual drinkers in male ALC patients who had obesity, while 30.0% (335 of 1,117) cases in the male ALC patients were without obesity ( $P < 0.001$ ). Such tendency was not observed in female ALC patients. More than 90% (650 of 719) of the male habitual drinkers had either DM or obesity (or obesity-related complications), whereas less than half of the female habitual drinkers had a concomitant complication (Fig. 3c;

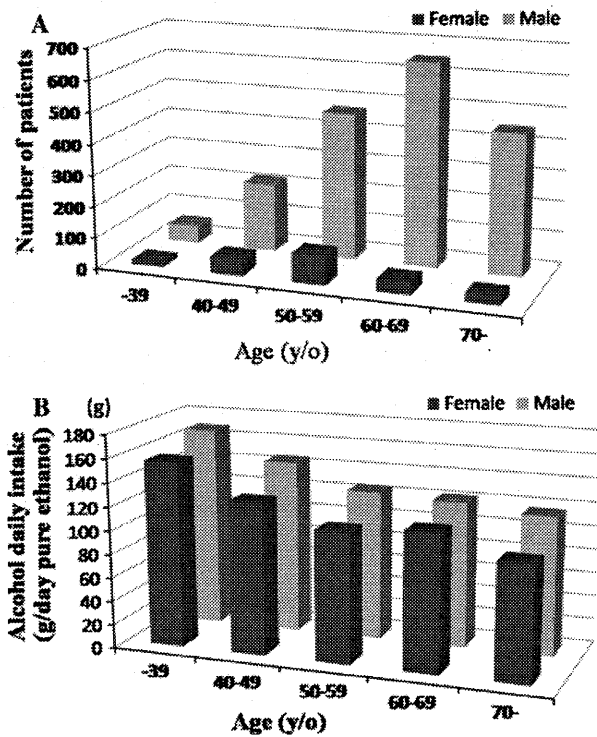
**Table 2** Daily alcohol intake, and the duration of alcoholic liver cirrhosis

	Total (2,070)	Male (1,843)	Female (227)
Number			
Age (year)	57.2	57.7*	52.8
Daily intake (g/day)	123	126*	115
Duration (year)	33.4	34.3*	25.8
Number (%)			
Daily alcohol intake			
60–110 g (habitual drinking)	860 (41.5%)	719 (39.0%)**	141 (62.1%)
$\geq 110$ g (heavy drinking)	1,210 (58.5%)	1,124 (61.0%)	86 (37.9%)

Data are expressed as mean values. The daily alcohol intake is expressed as 100% ethanol/day

\*  $P < 0.05$  versus female

\*\*  $P < 0.001$  versus female

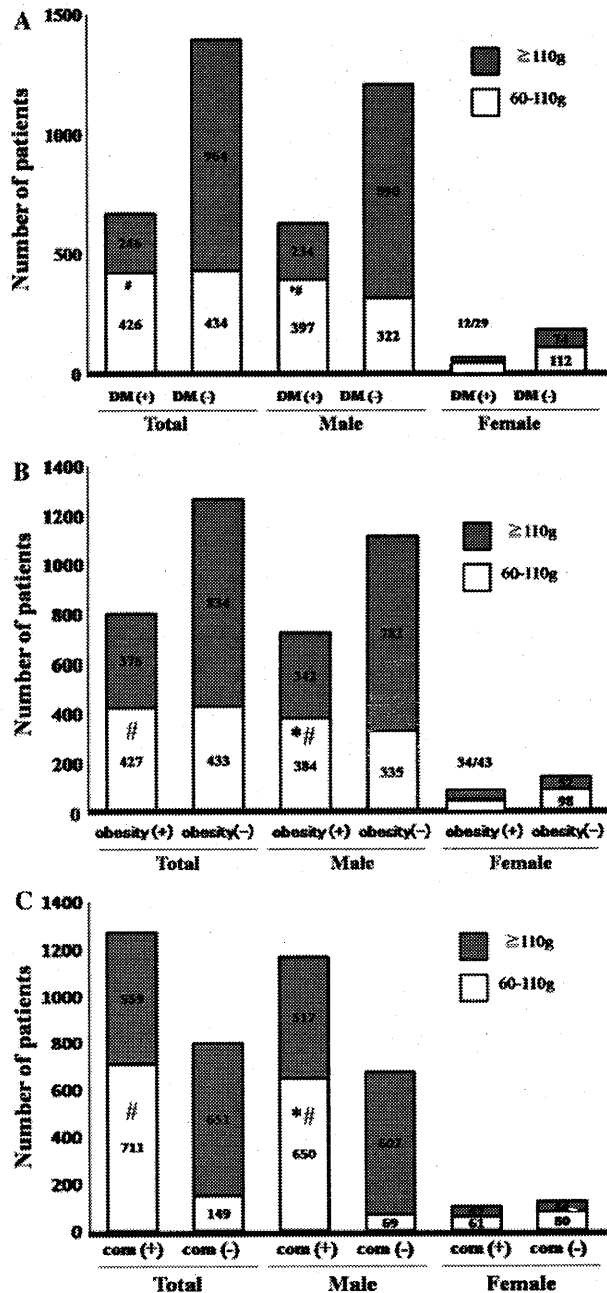


**Fig. 2** The number of alcoholic liver cirrhosis patients in each age band and gender (a), and the amount of daily alcohol intake (b). The peak for male patients was in the 60–69 year range, while the peak for the female gender was in the 50–59 year range. Age and the amount of daily intake showed inverse correlation: the younger the subject, the greater was alcohol intake

$P < 0.001$ ). Only 10% (69 of 719) of the male ALC patients without DM or obesity were habitual drinkers.

**Discussion**

While it has been recognized that alcohol and HCV are both common causes of LC in developed countries, and HBV is the major cause in many Asian and African developing countries, adequate knowledge on the recent worldwide changes in the distribution of LC etiologies is lacking. Currently, an assay system for determining HCV markers has become available, and a high frequency of HCV infection in patients with ALD has been reported. In 1992, the Takada group [2] set the current diagnostic criteria for ALD in Japan, which includes an etiological diagnosis of ALD associated with HCV infection. The Takada study reported that hepatitis virus is a significant factor in the pathogenesis of ALD, especially LC, and HCC in heavy drinkers [2]. In recent years, the combination therapy with interferon and ribavirin has improved the prognosis of HCV. Likewise, anti-viral drugs such as entecavir and tenofovir appear to have shown a significant



**Fig. 3** The number of ALC patients and their daily intake of alcohol (less or more than 110 g/day) with or without DM (a), obesity (b), and any other complications like DM and/or obesity (c). Daily alcohol intake is expressed as 100% of ethanol/day. \* $P < 0.001$  versus female, # $P < 0.001$  versus  $\geq 110$  g group. DM diabetes mellitus; com any complication (DM and/or obesity)

prognostic benefit in patients with HBV. Therefore, the incidence of hepatitis virus among heavy drinkers might have changed since the Takada survey [2].

The present survey revealed that HCV remains a major etiologic factor for LC in Japan (Fig. 1). Furthermore, a potential significant finding in the present study is that the

ratio of heavy drinkers with any markers of hepatitis virus was decreasing in the last decade: 15% for LC in 1998, according to the Japanese Society of Hepatology [3], versus 6% in the present study. Nowadays, people in Japan can receive free screenings for HCV and HBV, which were not available earlier. Some patients with hepatitis virus appear to drink alcoholic beverages without being aware of their infection. Educating the people on the risks of viral hepatitis might decrease the influence of hepatitis virus infection on ALC, but it is still a significant factor in the progression of ALC. Recognizing the risks of drinking is important not only for heavy drinkers but also for habitual drinkers harboring hepatitis virus.

A previous nationwide survey [3] reported that among all forms of liver diseases, the prevalence of ALD was increasing in Japan in parallel with an increase in the alcoholic beverage consumption. However, the prevalence of ALD in more recent years has continued to increase, in spite of no further increases in the alcoholic beverage consumption [3]. One tenable reason for the increase in ALD without an increase in the alcohol intake might relate to an increase in the number of female drinkers [13]. It has been reported that lower amounts of ethanol can cause some forms of ALD like severe alcoholic hepatitis and ALC in female drinkers [10, 11]. The expansion of alcoholic beverage consumption from men to women appears to have resulted in an increase in the number of patients with ALD. Epidemiologic evidence clearly indicates that the adverse consequences of alcohol consumption, including ALC, develop faster and require a lower level of alcohol exposure in the female gender than in the male gender [10, 11]. Although these observations were made by taking into account differences in body weight, fat distribution, body water, and other potentially confounding variables, women have greater ethanol clearance per unit lean body mass, and approximately the same liver volume as men, explaining an equivalent alcohol elimination rate when men and women are compared on the basis of liver size [14]. It has also been reported that women have less first-pass metabolism related to a lower gastric chi-ADH activity [15], suggesting a greater gender difference in first-pass metabolism with high rather than low concentrations of alcohol. The pharmacokinetic differences may increase the vulnerability of women to the effects of ethanol.

The peak age for male patients was in the 60–69 year age range, while the peak for female patients was in the 50–59 year age range (Fig. 2). More than 70% of the male patients were over 60 years of age, while only 40% of the female patients were over 60 years. Age and daily intake of alcohol were inversely correlated.

Currently, there is a growing interest in understanding the mechanisms responsible for the gender difference in ALD [16, 17]. It is likely that gender differences in ALD

reflect gender difference in the breakdown and elimination of alcohol and its byproducts, including differences in acetaldehyde levels within the liver [16, 17] and the activation of inflammatory and immune cells like Kupffer cells in the liver in response to ethanol metabolites [16–19]. In a study with animals fed on an ethanol-rich diet, female rats exhibited a higher level of circulating lipopolysaccharides in the blood than male rats [20]. Likewise, in rats with or without estrogen replacement after continuous ethanol exposure, the ethanol-induced increase in serum alanine aminotransferase (ALT) levels was abolished by ovariectomy, but was fully reversed by estrogen replacement [21]. It has been reported that the sensitivity of rat liver to alcohol-induced injury is directly related to estrogen concentration [21, 22]. Estrogen seems to enhance ethanol-induced inflammation in the liver, yet a protective effect for estrogen on liver fibrosis has been reported [22]. These findings suggest that estradiol suppresses hepatic fibrosis, and may in part reflect a more rapid progression of hepatic fibrosis and its complications in postmenopausal women [23]. In fact, in the present study, the peak for ALD in female patients was in the 50–59 year range with a less amount of daily alcohol intake than the male patients. In that period, most female patients had postmenopausal reduction in the estrogen level, suggesting that the postmenopausal reduction in the estrogen level may be associated with a rapid progression of ALD in the presence of lower alcohol consumption in female patients. In contrast, all young (<40 years) male and female patients appeared to drink more than an equivalent of 100 g pure ethanol a day with no gender difference in the amount of daily ethanol intake. However, a protective effect of estrogen cannot be found in heavy drinkers.

Iturriaga et al. [24] have suggested that the overall period of drinking, age, and an increase in body weight are important factors in histologic tissue changes associated with ALD. In particular, they found that ALD advances as the obesity level increases in an individual. According to these authors [24], obesity is a significant risk factor for ALD. Likewise, in a clinical study factoring a much larger population in France, Naveau et al. [9] carried out liver biopsy in 1,604 alcoholics and found a correlation between their histopathologic findings and the risk factors for the progression of ALD (age, gender, daily intake of ethanol during the past 5 years, duration of habitual drinking, and percent obesity). In this study [9], obesity was a significant risk factor for fatty liver (402 cases), alcoholic hepatitis (119 cases), and LC (608 cases) among various forms of ALD. Our present findings also showed an association between BMI and the prevalence of ALC.

It has been reported that blood glucose was independently correlated with the fibrosis score [25]. This was based on the knowledge that hyperglycemia seen in

patients with an elevated fibrosis score may reflect an impaired glucose homeostasis in patients with moderate to severe cirrhosis [26]. Likewise, it is known that patients with fatty liver disease who are obese and have DM develop sinusoidal fibrosclerosis [27].

In the present study, the peak ALC for male patients was in the 60–69 year age band, and more than 70% of the male patients were over 60 years. Age and the amount of daily alcohol intake were inversely correlated, suggesting that age is also a significant risk factor for ALC. Even habitual drinking an equivalent of 60–110 g pure ethanol a day, which is not excessive drinking can cause ALC in the long term. It would appear that the total amount of ethanol consumed is an important factor for developing liver fibrosis [28].

In conclusion, obesity, type 2 diabetes, age, and female gender appear to be additional significant risk factors for the progression to ALC. Accordingly, these factors should help to identify alcoholic patients who potentially may progress to ALC even without excessive alcohol intake (habitual drinking 60–110 g of ethanol a day) in the presence of the aforementioned risk factors.

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WHO 世界戦略を踏まえたアルコールの有害使用対策に関する総合的研究  
（研究代表者 樋口 進）

平成 25 年度分担研究報告書

アルコールの社会的問題・スクリーニングテスト・生物学的マーカーのレビューとマニュアル作成

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研究要旨

アルコール使用障害の早期発見、評価のため、バイオマーカーの測定とスクリーニングテストが有用である。アルコール使用のバイオマーカーとして、いくつかのマーカーが用いられているが、感度や特異度にさがあり、新たなバイオマーカーの開発が求められている。また、アルコール関連問題のスクリーニングテストとしては、AUDIT をはじめとして様々なテストがあるが、どのようなテストが有用であるかについての包括的なガイドラインはない。本研究は、アルコール関連障害に関係するバイオマーカー及びスクリーニングテストの文献レビューを行い、臨床的な使用ガイドラインを作成することを目的としている。

A. 研究目的

本研究の目的は、アルコール関連障害に関係する様々なバイオマーカー及びスクリーニングテストについて、包括的に文献のレビューにより、臨床的な有用性のエビデンスを評価し、臨床的な使用ガイドラインを作成することである。

B. 研究方法

研究方法として、文献レビューの方法を用いる。アルコールのバイオマーカーおよびスクリーニングテストについての研究文献を、PubMed などによる検索によって包括的に網羅して、各文献のレビューを行う。レビューを行う際には、各研究の信頼性を考慮に入れる。

（倫理面への配慮）

文献レビューによる研究のため、倫理的な問題が発生する可能性はないものと思われる。

C. 研究結果

初年度の研究として、アルコールに関連する血清学的なバイオマーカーについての包括的な文献レビューを行った。

Pubmed による検索では、alcohol+biomarkers あるいは biological markers のキーワードの検索にて、14,760 の文献が存在し、その数は年々増加傾向にあった。各血清学的マ

ーカーの内訳によると、ガンマグルトミルトランスフェラーゼ（GGT）、カーボヒドロレートデフィシエントトランスフェリン（CDT）についての文献が多く、その他、平均赤血球容積（MCV）、エチルグルクロニド（EtG）、ホスファチジルエタノール（PEth）、脂肪酸エチルエステル（FAEE）についての文献が多くあった。臨床的な応用については、アルコール依存症、アルコール性肝障害、胎児エタノール症候群、法医学的な活用、飲酒運転と関連した文献が多かった。

D. 考察

本年度の文献レビューに基づいた報告書を作成し、次年度にスクリーニングテストについてのレビュー、最終年度に、レビューに基づいた臨床的ガイドラインを作成する予定である。

E. 研究発表

1. 論文発表  
特になし
2. 学会発表  
特になし

F. 知的財産権の出願・登録状況

1. 特許取得：特になし
2. 実用新案登録：特になし
3. その他：特になし

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WHO 世界戦略を踏まえたアルコールの有害使用対策に関する総合的研究  
（研究代表者 樋口 進）

平成 25 年度分担研究報告書

成人の飲酒実態調査、アルコールの健康問題のレビューおよびリスク評価チャート作成  
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研究要旨

今年度の本分担研究は、わが国の成人の飲酒実態調査のうち、アルコールハラスメントなどアルコールによる間接被害の実態を客観的に把握し、非飲酒者の飲酒者からの保護対策の課題を明らかにすることを主な目的とした。本年度は、わが国の成人 7052 人を対象とした全国調査を実施し、わが国の成人の飲酒行動の実態やアルコールの有害な使用の実態などを明らかにすることができた。わが国の成人の飲酒行動に関する全国調査の有効回答は 4153 名（有効回答率 55.4%）であった。

家族からの飲酒が原因で困った経験の割合は、父親からの飲酒が原因で困った経験が 7.2%と最も多く、次いで配偶者からが 2.8%であった。この家族からの飲酒が原因で困った経験が回答者の生き方や考え方への影響の状況について検討したところ、かなり影響を与えた 21.4%、重大な影響を与えた 4.5%であった。家族以外からの飲酒が原因で困った経験の割合は、職場の飲酒が原因で困った経験が 9.2%と最も多く、次いで友人・知人 5.7%、親戚 4.5%、知らない人 4.1%、仕事の相手 2.9%であった。家族以外からの飲酒が原因で困った経験が回答者の生き方や考え方への影響の状況について検討したところ、かなり影響を与えた 7.4%、重大な影響を与えた 1.2%であった。

アルコールハラスメントの実態としては、家族からは父親の飲酒が、家族以外では職場の飲酒が原因で困った経験が最も多かった。調査回答者のおよそ 4 人に 1 人は家族の飲酒が原因による困った経験、およそ 10 人に 1 人は家族以外の飲酒が原因による困った経験で、その後の生き方や考え方へ大きな負の影響があったことが推察された。したがって、現状は飲酒が個人の嗜好のみに任せている状態であるが、今後は、地域保健と産業保健が連携して総合的にアルコール対策に取り組むことが効率的・効果的なアルコール対策の展開であると考えられた。

A. 研究目的

アルコール対策において実態をモニタリングするのは、最も基本的な公衆衛生学的な対策である。わが国の成人の飲酒実態の既報は、調査主体、調査方法に限界があり、国際比較できる実態はほとんど明らかになっていない。わが国の成人の飲酒行動の特徴を明らかにし、到達点と課題を明確にし、アルコール対策を評価し、今後の対策を提言するには代表性のある全国調査は必須の調査である。また、アルコールハラスメントなどアルコールによる間接被害の実態調査を全国規模で実施する研究は極めて珍しく、アルコールの有害な使用に対する対策を立案する基礎データとなりえる。

代表性のある全国調査を実施し、わが国の成人の飲酒行動の実態を明らかにし、アルコール

対策の成果を評価し、残された課題を明確にし、今後のアルコール対策推進のための提言を行うことを目的とした。また、本年度の分担研究では、アルコールハラスメントなどアルコールによる間接被害の実態を客観的に把握し、非飲酒者の飲酒者からの保護対策の課題を明らかにすることを主な目的とした。

この研究により、アルコールハラスメントの実態、アルコールハラスメント被害が人生に与える影響などを明らかにした。全国調査を行うことで、わが国のこれらの実態を明らかにすることができた。



## B. 研究方法

初年度は、成人の飲酒実態調査を実施した。本研究は、全国を代表する標本抽出による無作為調査による訪問面接調査および自記式留め置き調査とした。調査内容には、飲酒行動の実態、飲酒頻度、飲酒量、アルコールハラスメントの被害状況などを含むものである。調査の詳細は、当研究班分担研究者の尾崎米厚先生の記載をご参照いただきたい。

### ・標本抽出

標本抽出は、無作為抽出方法により、全国の20歳以上の男女7052人を無作為に抽出した。

### ・訪問面接調査

調査は、全国一斉に2013年7月13日から8月11日までの間に実施した。各地区の調査員が対象者のもとに出向き、面接調査部分は面接により聴取した。自記式質問紙調査票は、事前に記入してもらい、調査員が訪問の際に確認し、回収した。有効回答は、4153人（有効回答率55.4%、男性1869人、女性2284人）であった。なお、実際の調査は上記標本抽出も含め、社団法人中央調査社に委託した。

### ・アルコールハラスメントの把握

飲酒による迷惑行為を、わが国ではアルコールハラスメントと呼んでいる。この項目については以下の内容を組み入れた。飲酒が原因で困った経験、すなわちアルコールハラスメントの被害の経験を、家族内のもの（親、配偶者）と家族外のもの（親戚、職場関係者、友人・知人）に分け、それぞれ尋ねた。また、その困った経験が、被害者の生き方や考え方への影響を与えたかどうかについても、家族内外それぞれに関して質問した。

### ・解析

得られた調査結果は、研究代表者と調査担当の分担研究者に個人情報を外した形で送付され、集計解析に用いた。

### ・倫理面への配慮

面接調査では、質問票調査に関しては無記名調査票を用いるが、自宅への訪問調査であるた

め、個人の住所地など個人情報に触れることになる。そこで研究代表者の施設（国立病院機構久里浜医療センター）にて倫理審査にて審議後、承認された。

調査に際して、標本抽出は総務省、市町村役場にて住民基本台帳法などで定められた申請を行い、調査員が住民基本台帳を閲覧して、無作為に抽出した。調査対象者に対しては、調査の趣旨、内容等を記した文書を郵送し、調査の内容を伝えた。その後に調査員が自宅を訪問し、対象者に対して調査の趣旨、内容、方法等を説明して同意の得られた場合に調査を実施した。得られたデータは保管を厳重にし、扱いは本研究の関係者に限るよう配慮している。データの発表に際しては、調査対象者個人が特定される恐れのないように配慮した。

## C. 研究結果

### 1. 回答者の状況

対象者7052人のうち、調査票が回収できた回答者は4153人（有効回答率55.4%）であった。

### 2. 年代別による集計

図1に、年代別による家族からの飲酒が原因で困った経験の割合を示した。全体では、父親からの飲酒が原因で困った経験が最も多く7.2%を占めた。次いで配偶者からが2.8%であった。母親からはわずかであった。年代別にみると、父親からの飲酒が原因で困った経験を有するのは、40代、50代、30代の順で、10%前後にみられた。配偶者からの飲酒が原因で困った経験は、30代以上で年代に関わらず、ほぼ3%前後にみられた。母親からの飲酒が原因で困った経験は、30代で1.8%みられるが、それ以外の年代では、1%未満にすぎなかった。

図2に、家族からの飲酒が原因で困った経験が回答者の生き方や考え方への影響の状況について年代別に示した。全体では、影響を与えなかった31.6%、少し影響を与えた41.0%、かなり影響を与えた21.4%、重大な影響を与えた

4.5%、無回答 4.5%であった。年代別に検討したところ、どの年代でも、分布の傾向に大きな差はみられなかった。影響を与えなかったという回答がほぼ3割前後、少し影響を与えたという回答がほぼ4割前後であった。しかしながら、かなり影響を与えたという回答が2割前後、重大な影響を与えたという回答が5%前後にみられた。つまり、調査回答者のおよそ4人に1人は、家族の飲酒が原因による困った経験でその後の生き方や考え方へ大きな負の影響があったことが推察された。

図3に、年代別による家族以外からの飲酒が原因で困った経験の割合を示した。全体では、職場の飲酒が原因で困った経験が最も多く9.2%を占めた。次いで友人・知人からが5.7%、親戚4.5%、知らない人4.1%、仕事の相手2.9%であった。年代別にみると、職場の飲酒が原因で困った経験を有するのは、40代、30代の順で、12%強にみられた。友人・知人からの飲酒が原因で困った経験は、30代、20代の順で、10%前後にみられた。親戚からの飲酒が原因で困った経験は、50代で6.9%みられたが、それ以外の年代では、5%未満だった。知らない人からの飲酒が原因で困った経験は、20代-40代に7%弱みられた。仕事相手からの飲酒が原因で困った経験は、全年代で3%前後みられた。

図4に、家族以外からの飲酒が原因で困った経験が回答者の生き方や考え方への影響の状況について年代別に示した。全体では、影響を与えなかった55.9%、少し影響を与えた32.8%、かなり影響を与えた7.4%、重大な影響を与えた1.2%、無回答2.8%であった。年代別に検討したところ、年代間で多少の差はみられるが、分布の傾向に大きな差はみられなかった。影響を与えなかったという回答がほぼ5割前後、少し影響を与えたという回答がほぼ3割前後であった。しかしながら、かなり影響を与えたという回答が1割前後、重大な影響を与えたという回答が1%前後にみられた。つまり、調査回答者のおよそ10人に1人は、家族以外の飲酒が原因

による困った経験でその後の生き方や考え方へ大きな負の影響があったことが推察された。

#### D. 考察

わが国の成人の飲酒実態を明らかにするため、本年度は、わが国の成人7052人を対象とした全国調査を実施した。分担研究課題であるアルコールハラスメントの実態としては、家族からは父親の飲酒が、家族以外では職場の飲酒が原因で困った経験が最も多かった。調査回答者のおよそ4人に1人は家族の飲酒が原因による困った経験、およそ10人に1人は家族以外の飲酒が原因による困った経験で、その後の生き方や考え方へ大きな負の影響があったことが推察された。

本調査結果の飲酒にまつわるアルコールハラスメントの被害経験の状況をみると、青壮年期での被害経験が多い結果が得られた。アルコールハラスメントの被害経験の状況をみると、家庭内ではおよそ4人に1人が経験し、家庭外ではおよそ10人に1人が被害経験を有していた。アルコール対策は、家庭や職場の両面からの対策が有効である可能性が示唆された。家庭に対するアルコール対策は地域保健の一環として、職場に対するアルコール対策は産業保健の一環として総合的に取り組むことは必要であると思われた。これら関係機関が協力して、対策にあたることで効率的・効果的なアルコール対策の展開であると考えられた。

アルコール対策は、現状では個人の嗜好のみに任せている状態であるが、今後は国民の身体や健康を守る立場から、アルコールについて公衆衛生上の対策を打ち出していく必要があると思われた。2010年5月WHO総会にて、「アルコールの有害な使用を軽減するための世界戦略」が決議され、健康障害の予防を含めた、アルコールに対する総合対策推進は世界的な動きになりつつある。わが国においても、アルコールの健康障害に対する対策が求められ、国会にてアルコール健康障害対策基本法が2013年

12月に成立した。この法律の概要として、まずアルコール健康障害を「不適切な飲酒（アルコール依存症その他の多量の飲酒、未成年者の飲酒、妊婦の飲酒等）の影響による心身の健康障害」と定め、次いで、アルコール健康障害対策に対して、国・地方公共団体、酒類の製造または販売を行う事業者、国民、医師等および健康増進実施事業者の責務を規定している。そして、政府は法律施行後、2年以内にアルコール健康障害対策推進基本計画を定めることとしている。それを受けて、都道府県は、国の基本計画をもとに実情に即した推進計画を策定する予定となっている。今後、アルコールの健康障害防止の動きは広がりを見せていくと思われる。

現状では、2013年4月より、標準的な健診・保健指導プログラム【改訂版】で保健指導におけるアルコール使用障害スクリーニングとその評価結果に基づく減酒支援が厚生労働省より示された。40才以上を対象とした特定健診の標準的質問票で、1回飲酒量日本酒換算1~2合以上のアルコールを「毎日」又は「時々」飲むと答えた人が対象としている。そして、対象者には、WHOが問題飲酒者を早期に発見することを意図して作成した、アルコール使用障害同定テスト(AUDIT)を行う。このAUDITで、15点以上はアルコール依存症が疑われ専門医療機関への受診につなげ、8~14点は保健指導として減酒支援(ブリーフインターベンション)を行うことが示されている。減酒支援(ブリーフインターベンション)とは、飲酒量を減らす具体的な目標を自ら設定し、飲酒日記をもとにカウンセリングを2回行う方法で、WHOが開発研究し、その有効性は確立されている。この特徴は、①断酒ではなく、飲酒量の減量为目标とする、②アルコールの専門家でなくても保健指導実施者が行うことができる、③アルコール依存症の患者でなく、依存症でない方を対象に行うことである。しかし、これは保健指導実施者が任意で活用するため、現在のところ大きな流れには至っていない。

本研究結果にはいくつかの限界が含まれている。調査結果は、集計や単純分析にとどまっている。今後詳細な結果を加え、わが国の成人の飲酒行動実態の解明にあたる予定である。また断面調査であり、因果関係を明らかにした調査ではない。この他、調査に回答した者のみの集計や単純分析結果であるため、示された結果は過少評価となっている可能性が含まれている。今後、継続的に全国調査を行うことによって、データの蓄積からわが国の成人の飲酒行動の実態を明らかにしていく必要がある。

本調査結果は、わが国の成人におけるアルコールハラスメントの実態に迫り、青壮年期の家庭の内外の被害がみられることを明らかにした。アルコール対策推進にあたっては、地域保健と産業保健が総合的に取り組むことは必要であると思われた。アルコール健康障害に対する法律がわが国で制定され、今後アルコール対策がより強力に推進されることが期待される。今後、調査により詳細な検討を加え、わが国に成人の飲酒行動の解明につながるようし、公衆衛生的示唆が与えられるようにしていく予定である。

また、来年度以降、アルコールの健康問題のレビューおよびリスク評価チャート作成を作成し、広く国民に適正飲酒の知識や行動の啓発に寄与する取組みを展開したいと考えている。

## E. 研究発表

### 1. 論文発表

1) H Kanda, Y Osaki, Y Kaneita, O Itani, M Ikeda, T Ohida, S Higuchi.

Alcohol drinking rates of male between 7th and 11th graders in Japan decreased gradually based on nationwide repeated cross-sectional surveys from 1996 to 2008. Health 2013; 5(6A3):12-17.

DOI: 10.4236/health.2013.56A3003

2) 神田秀幸. わが国の喫煙、飲酒習慣の推移とその特徴. 動脈硬化予防 2014;12(4):5-10.

## 2. 学会発表

神田秀幸、尾崎米厚、岡村智教、大井田隆、樋口進. アルコールハラスメントの被害および未成年者に対する被害・加害に関する実態調査. 日本アルコール・薬物医学会雑誌 2013 ; 48 (4) : 180 (第 48 回日本アルコール・薬物医学会 平成 25 年 10 月 5 日 岡山)

## F. 知的財産権の出願・登録状況

当該なし

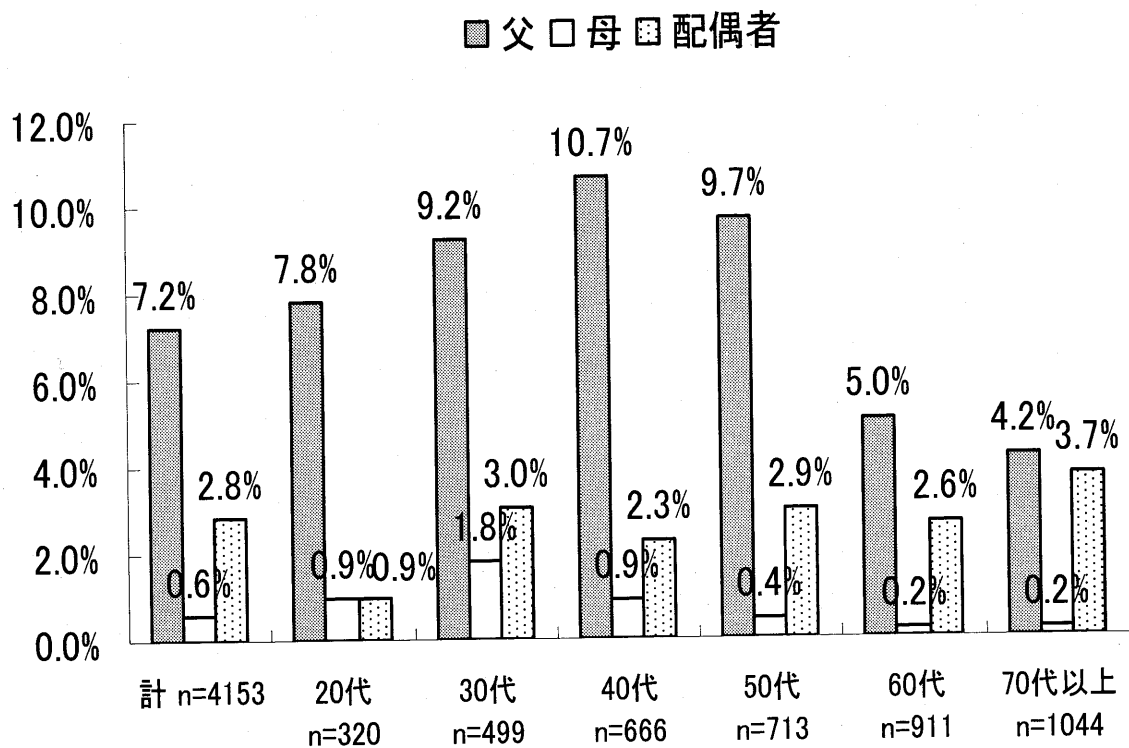


図 1. 家族からの飲酒が原因で困った経験の割合(年代別)

□ 影響を与えなかった □ 少し影響を与えた ▨ かなり影響を与えた ■ 重大な影響を与えた □ 無回答

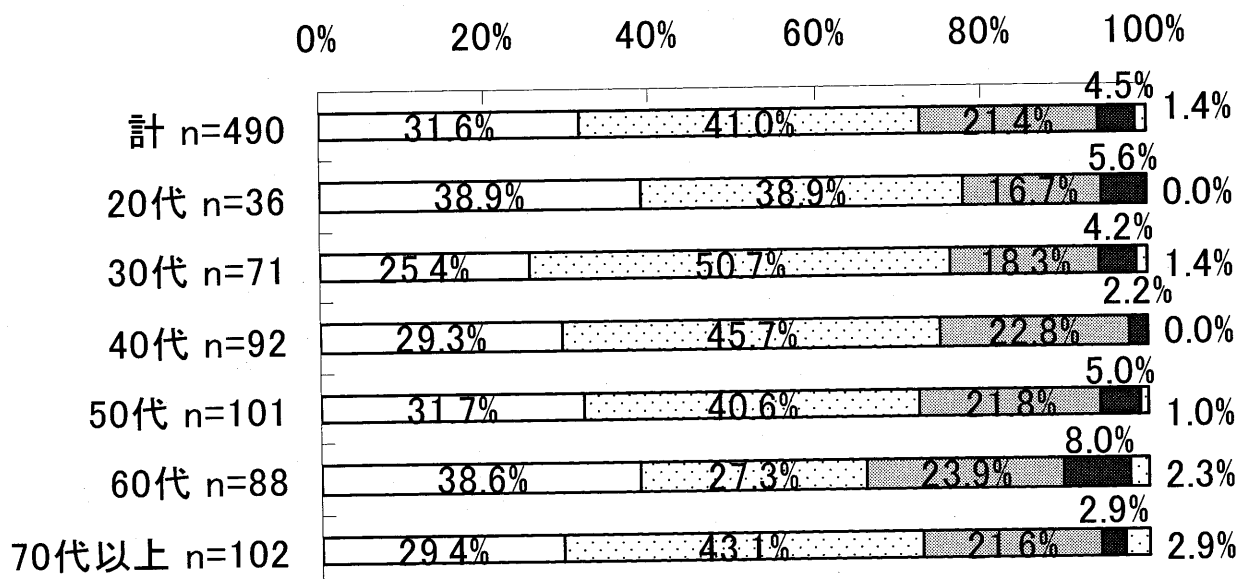


図 2. 家族からの飲酒が原因で困った経験が回答者の生き方や考え方への影響の状況(年代別)

■ 職場 □ 友人・知人 □ 親戚 ■ 知らない人 □ 仕事の相手

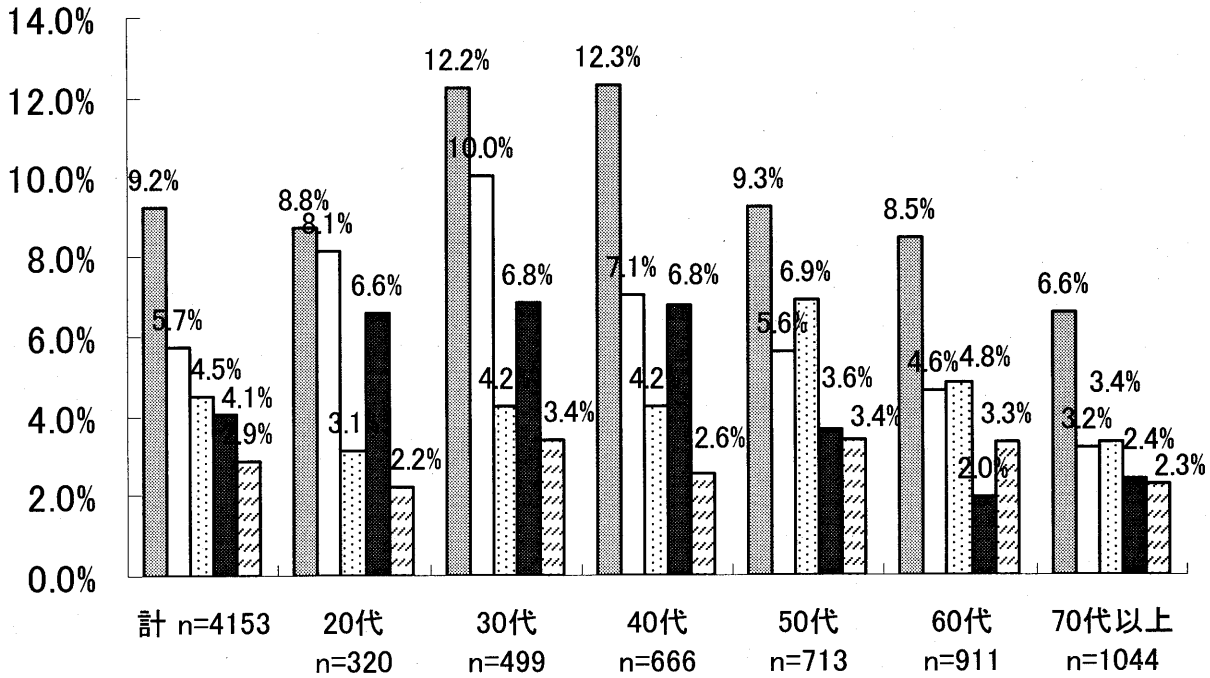


図 3. 家族以外からの飲酒が原因で困った経験の割合 (年代別)

□ 影響を与えなかった □ 少し影響を与えた □ かなり影響を与えた ■ 重大な影響を与えた □ 無回答

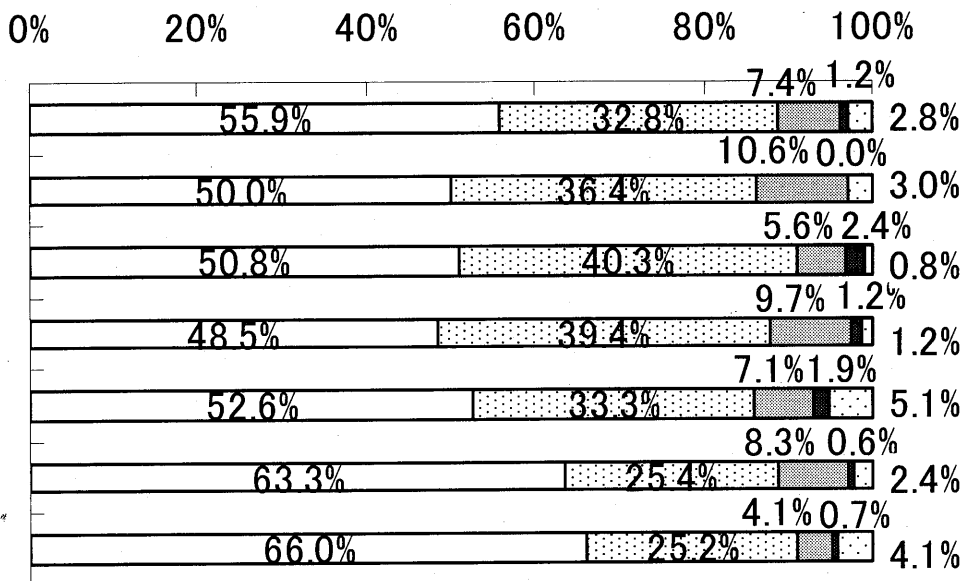


図 4. 家族以外からの飲酒が原因で困った経験が回答者の生き方や考え方への影響の状況 (年代別)

研究成果の刊行に関する一覧

書籍

著者氏名	論文タイトル名	書籍全体の編集者名	書籍名	出版社名	出版地	出版年	ページ
当該なし							

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
H Kanda, Y Osaka, Y Kaneita, O Itani, M Ikeda, T Ohida, S Higuchi.	Alcohol drinking rates of male between 7th and 11th graders in Japan decreased gradually based on nationwide repeated cross-sectional surveys from 1996 to 2008.	Health	5(6A3)	12-17	2013
神田秀幸	わが国の喫煙、飲酒習慣の推移とその特徴	動脈硬化予防	12(4)	5-10	2014

# Alcohol drinking rates of male between 7th and 11th graders in Japan decreased gradually based on nationwide repeated cross-sectional surveys from 1996 to 2008

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## ABSTRACT

Early drinking is considered to result in making tolerant of alcohol consumption and a higher prevalence of alcohol related disorders in the later. We focused generational impacts on drinking rate among high school students based on multiple nationwide data. The surveys were nationwide, cross-sectional random sampling surveys given every 4 years from the Japanese Youth Tobacco and Alcohol Surveys, 1996 to 2008. Participants were male 53,925 high school students from 7th grade to 11th grade. We divided to the three follow-up groups every 4 years from 1996 to 2004 for male junior high school students in 7th grades and the end periods were 4 years later in 11th grades. Outcome measures in this study were life time drinking, current drinking within 30 days and weekly drinking. All drinking rates decreased each at 7th and at 11th grade. The increments in these drinking rates from 7th grade to 11th grade in males decreased gradually in recent follow-up groups. Generational impacts should be considered by using follow-up groups to study drinking behaviors among students.

**Keywords:** Drinking Rates; Repeated Cross-Sectional Study; National Wide Survey; Japan

## 1. INTRODUCTION

Alcohol drinking is one of the most important risk

factor for lifestyle related diseases. Early drinking is considered to result in making tolerant of alcohol consumption and a higher prevalence of alcohol related disorders in the later [1].

Alcohol drinking rates among adolescents have also been reported [2-6]. However, most of these data were based on only cross-sectional studies. When estimating the rate increment for a follow-up group, the slope may be distorted by cohort effects [7-9]. The shapes of trends among adolescents by studying follow-up groups have not been examined at a national level. The variations in drinking rate among adolescents by follow-up groups have not been studied by follow-up groups at a national level, and no reported study has compared trends among multiple follow-up groups in a nation. Frequent observations are needed to compare trends in drinking rates among multiple follow-up groups belonging to the same grade in different years.

In this study, we looked at trends and generational impact on drinking rate by using follow-up groups of male Japanese high school students to quantitatively assess differences in trends. We used nationwide data from the Japanese Youth Tobacco and Drinking Surveys, gathered every 4 years between 1996 and 2008.

## 2. SUBJECTS AND METHODS

### 2.1. Subjects

The surveys were nationwide, cross-sectional random sampling surveys given every 4 years from 1996 to 2008, using the single-stage cluster sampling methodology [10].



Previous studies detailing the Japanese Youth Tobacco and Drinking Surveys have been reported [5,11-16]. The cluster unit of the sampling was schools. The survey targeted junior and senior high school students from schools selected through Japan using the National School Directory. All students enrolled in the sampled schools were subjects of the study.

The number of schools sampled in the 1996 survey was 122 of 11,274 junior high schools (selection rate: 1.1%) and 109 of 5501 senior high schools (2.0%). Respective values for the 2000, 2004 and 2008 surveys were 132 of 11,200 junior (1.2%) and 102 of 5315 senior high schools (1.9%) in the 2000 survey, 131 of 11,060 junior (1.2%) and 109 of 5272 senior high schools (1.9%) in the 2004 survey, and 130 of 10,955 junior (1.2%) and 110 of 5115 senior high schools (2.0%) in the 2008 survey.

## 2.2. Questionnaire

We requested the cooperation of the principals of these schools and sent these individuals questionnaires for their respective school's student population. The teachers were asked to inform the students of the voluntary nature of their participation and to urge them to answer honestly. Anonymous questionnaires and envelopes were handed to the students for completion during school time. Upon completion, the questionnaires were sealed in the envelopes by the students themselves, collected by their teachers, and returned to our researchers unopened. This survey was reviewed and approved by the institutional review board of Nihon University (No. 19-5-0).

The questionnaire focused on drinking experience, drinking frequency and age. Experimenting drinkers, current drinkers, and weekly drinkers were defined as those who had tried drinking at least once, those who had drunk at least once in past 30 days, and those who had drunk at least once in past 7 days, respectively.

## 2.3. Responses

For the 1996 survey, responses were obtained from 80 junior (response rate 65.5%) and 73 senior high schools (67.0%). In 2000, the respective values were 99 (75.0%) and 77 schools (75.5%), and in 2004, there were 92 (70.2%) and 87 schools (79.8%). In 2008, the respective values were 92 (70.8%) and 73 schools (72.7%).

We used data from the 1996-2004 surveys for male junior high school students in 7th grade, age 13. We divided to the three follow-up groups every 4 years from 1996 to 2004. The end periods were 4 years later when they had become 11th graders, age 17, from 2000 to 2008. **Table 1** shows a summary of follow-up groups. All group data includes all of the drinking rates from 7th grade to 11th grade. The total sample size of the 1996-

**Table 1.** Follow-up groups of male students in this survey, Japan, 1996-2008.

Follow-up groups	Years of Measurement		Sample size	
	Year in 7th grade	Year in 11th grade	Number of 7th grade	Number of 11th grade
1996 group	1996	2000	7,211	9,662
2000 group	2000	2004	8,248	12,241
2004 group	2004	2008	6,917	9,646

2008 surveys was 53,925. We compared drinking rate increments from 7th to 11th grade for 3 follow-up groups as well as each drinking rate in both 7th grade and 11th grade for 3 follow-up groups.

## 2.4. Statistical Analysis

The percentages in the tables were calculated by a weighting method based on one-stage stratified cluster sampling [10]. We estimated the mean values of drinking rate by follow-up group. We calculated the change in drinking rate by subtracting the previous drinking rate from the current one, by follow-up group. Data were analyzed using the SPSS ver. 21.0 software (SPSS, Tokyo, Japan).

## 3. RESULTS

### 3.1. Trends of Lifetime Drinking Rates

**Figure 1** shows the trends of the lifetime drinking rate for the three follow-up groups (1996, 2000 and 2004) of Japanese male students from 7th grade to 11th grade. The lifetime drinking rates decreased at 7th grade in 2004 in males. They also decreased at 11th grade from 2000 to 2008. However, the increments in the lifetime drinking rate from 7th grade to 11th grade in high school students were smaller in recent follow-up groups both in 2000 and in 2004 than in follow-up groups in 1996. Then, those increments in follow-up groups between 2000 and 2004 were similar; around +15.6% - +15.9% in males from 7th grade to 11th grade.

### 3.2. Trends of Current Drinking Rates

**Figure 2** shows the trends for current drinking rate for male students from 7th grade to 11th grade for three follow-up groups (1996, 2000, 2004). The current drinking rates decreased at 7th grade from 1996 to 2004 in males. They also decreased at 11th grade from 2000 to 2008. However, the current drinking rate increments from 7th grade to 11th grade decreased gradually one fourth from the 1996 follow-up group to the 2004 follow-up group.

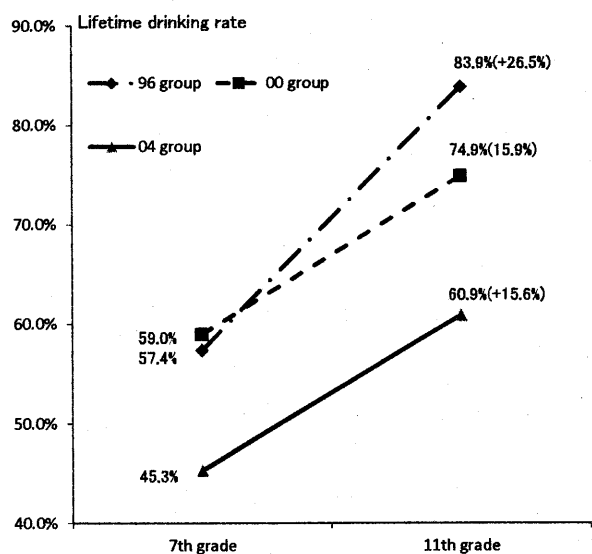


Figure 1. Lifetime drinking rate trends among male 7th - 11th graders by three follow-up groups (1996, 2000, 2004).

### 3.3. Trends of Weekly Drinking Rates

Figure 3 shows the trends for weekly drinking rate for male students from 7th grade to 11th grade for three follow-up groups (1996, 2000, 2004). The weekly drinking rates decreased at 7th grade from 1996 to 2004 both in males and females. They also decreased at 11th grade from 2000 to 2008. However, the weekly drinking rate increments from 7th grade to 11th grade grew gradually smaller from the 1996 follow-up group to the 2004 follow-up group; +11.1% in the 1996 group, +6.0% in the 2000 group and +3.8% in the 2004 group.

## 4. DISCUSSIONS

Alcohol drinking rates for more recent male students' follow-up groups from 7th grade to 11th grade in Japan were relatively lower than older follow-up groups in 1996. Recent lifetime drinking rate increments from 7th grade to 11th grade were stable in the 2000 and 2004 follow-up groups, though all drinking rates decreased in both 7th and 11th grade from 1996 to 2004. Then, both current and weekly drinking rate increments from 7th grade to 11th grade grew gradually smaller from the 1996 follow-up group to the 2004 follow-up group. To our knowledge, this is the first report in the nationwide survey to show the generational impact of drinking from 7th grade to 11th grade by follow-up groups. Our results show the importance of observing trends of drinking rates by using follow-up groups and monitoring a wide span of 4 years, not only at 7th grade but also at 11th grade.

### 4.1. Decreasing Factors of Drinking in Youth

Although our study was restricted to the period

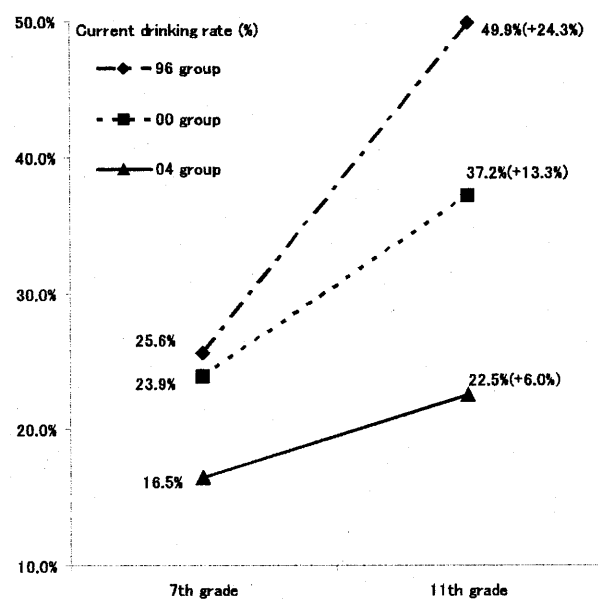


Figure 2. Current drinking rate trends among male 7th - 11th graders by three follow-up groups (1996, 2000, 2004).

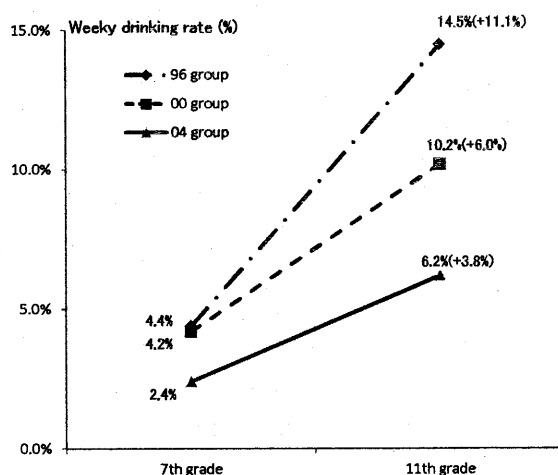


Figure 3. Weekly drinking rate trends among male 7th - 11th graders by three follow-up groups (1996, 2000, 2004).

from 7th grade to 11th grade among men, the drinking rate of the follow-up groups at 11th grade increased in each survey. Alcohol drinking rate is generally considered to increase with age. In recent follow-up groups, there has been a trend towards a decreased prevalence of drinking among adolescents in Japan.

There are several reasons to explain this result. First, alcohol policy may influence to youth. From 1997, warning label on the bottle has "prohibition of minor drinking" [17]. In 2000, Health People Japan, *i.e.*, national plan of strategy for 21 century's health, was enacted [18]. This includes a goal of minor drinking to zero. Revision of Act Prohibit Minor from Alcohol Use and revision of liquor tax were also performed in 2000 [17]. By this re-

vision of the act, age confirmation by retailers has become obligation and penalty has become severe. The National Tax Agency has got possible to cancel the license of liquor retailer which sold alcohol beverage to a minor, based on this revision of liquor tax [17]. The number of alcohol vending machines has decreased through voluntary regulation by industry from 2000 [19]. From 2003, severe punishment on drunk driving has started [20]. Additionally, voluntary regulation by a consultation of alcoholic beverage industry has begun on October 1st 2005, such as warning of prohibition of drinking before 20 years old on the TV commercials, avoiding the expression that a minor is interested in alcohol on the advertisements etc. [21]. However, many TV commercials for alcohol beverage are broadcasting still now. Second, parental drinking is one of the most important factors of adolescent drinking [22,23]. A decrease in the prevalence of drinking by adult men, including their fathers, probably contributed to the decrease among students. Peer drinking is also a well-known factor of adolescent drinking [24]. The decreased prevalence of drinking among students may also have contributed to a decrease in peer pressure to start drinking [24]. Finally, Japanese school students were given the opportunities to learn about alcohol and health in the life skill education in school from 2003. These alcohol policies and social environments contributed to the decrease of the drinking prevalence. Periodical nationwide surveys on adolescent drinking and survey of environmental factors are necessary to deal with the social problems of adolescent drinking.

#### 4.2. Alcohol Drinking Rates of Other Nations in Youth

Considering the worldwide drinking epidemic rates in adolescents, prevention of drinking in the earlier stages of life is an important public health priority. In the United States, Finland and Sweden, drinking prevalence among adolescents decreased in the early 2000s. However, the majority of the world has not observed any decrease in drinking prevalence. There are global trends to restrict drinking among adolescents based on the WHO global strategy to reduce the harmful use of alcohol [25]. Some countries may have begun taking action quickly to ensure implementation of this strategy. Our study focused on generational impacts on drinking by looking at follow-up groups. Few studies clarified these impacts in the world. In the future, the effects of generational impact need to be considered when monitoring follow-up groups for drinking prevalence.

#### 4.3. Repeated Cross-Sectional Study

A specific feature of this study was the use of a nationwide, repeated, cross-sectional survey with random

sampling to show the slope by follow-up group. In a cross-sectional study, each student at 7th grade is observed once, and in a longitudinal study each student is observed two times. In a repeated, cross-sectional survey, each student is observed once, but each follow-up group is studied two times. Thus, we can infer the slope of a follow-up group from a repeated, cross-sectional survey. A repeated, cross-sectional survey is usually reported as a cross-sectional curve by survey year [26], but such a cross-sectional slope is different from the slope of a follow-up group when a follow-up group effect occurs. In a cross-sectional slope, we see combined effects of follow-up group and year. When interpreting drinking rates twice, as we did here, the follow-up group effect should be considered. A repeated, regular survey is suited to monitoring trends by follow-up group because trends can be produced and checked for gradual changes by generation. The weakness of a repeated, cross-sectional survey, compared with a longitudinal study, is that all inferences are described in terms of population averages, and the variability of trends among individuals and the effects of covariates cannot be inferred. The slopes of the drinking rate obtained by following a single person longitudinally and that obtained by population average are well known to be different because the timing of drinking initiation varies greatly between individual people. A repeated, cross-sectional survey and a longitudinal study should be considered as being complementary.

#### 4.4. Limitations

One limitation of this study is the possibility of misclassification of drinking status among students. Although this study uses an anonymous questionnaire survey, the respondents may have been reluctant to report their actual drinking status due to more active anti-drinking policies in recent years. However, we considered the influence of misclassification of reported drinking status to not be large because the number of questionnaires with invalid or contradictory answers did not increase during this study period. Then, we focused only men at 7th graders in the baseline. Confirmation of the persistence of this decrease in prevalence will require periodic monitoring of adolescent drinking prevalence and related factors.

#### 4.5. Conclusions

Alcohol drinking rates among Japanese male students decreased both at 7th grade and at 11th grade. However, the drinking rate increments from 7th grade to 11th grade were smaller in recent follow-up groups than in older follow-up groups, which means most Japanese high school students did not start drinking cigarettes in the early 2000s. We have shown that monitoring trends by

follow-up group are important in studying drinking for public health. Values of drinking rates from a young age to adolescence by follow-up group should be examined. For this purpose, a repeated, cross-sectional survey is suitable. Values of drinking rate and regular changes in drinking rate are important because drinking rate changes dynamically during adolescence. Not only trends in drinking rates at fixed ages, but also generational impacts should be considered by using follow-up groups to study drinking behaviors among students. In the future, we need to continue careful monitoring of follow-up group drinking prevalence. When long-term health promotions are planned or assessed, policy makers need to look at changes in follow-up groups.

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