

Abstract

Prevalence and incidence of alcohol-related diseases by the level of alcohol intake

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South Korea is widely recognized as one of the world's largest markets for alcohol. In 2015, South Korea had the highest per capita consumption of distilled spirits in the world. Despite government guidelines for moderate drinking, the health implications of high alcohol consumption are not well known among the public. Apart from the mortality rate published by the Korean Statistical Information Service (KOSIS), the prevalence and incidence of alcohol-related diseases have not been formally established. In 2018, to form part of this study, a pilot study to establish a registry for alcohol-related liver disease and diabetes was conducted and the prevalence and incidence of alcohol-related diseases were estimated. To investigate the impact of alcohol, this study estimated the risk and prognosis of alcohol-related liver diseases and diabetes based on alcohol intake levels.

This study used 2013-2017 Korea Health Insurance Review and Assessment (HIRA) data and 2002-2015 Sample Cohort data from the National Health Insurance Services (NHIS). The case definition of alcoholic liver disease was one or more claims of K70*. To estimate the alcohol intake amount among the Sample Cohort, this study extracted data from individuals who participated at least once in a national health screening. Individuals who consumed alcohol ≥ 2 times per week and ≥ 7 glasses (≥ 5 for women) at one time were categorized into the high intake group, those who had ≤ 1 per month were put into the low intake group, and the rest were put into the middle intake group. The incidence of alcohol-related diseases was estimated by the level of alcohol intake. In addition, the prognosis of chronic hepatitis and diabetes by alcohol intake was evaluated.

According to HIRA, from 2013-2017 the prevalence of alcoholic liver disease was 9/1,000 persons, and according to the Sample Cohort the prevalence was 11.76/1,000 persons in 2003 and 10.45/1,000 persons, showing no increasing trend. The incidence of alcoholic liver disease was 4.68/1,000 persons from HIRA 2013-2017, and 9.07/1,000 persons in 2003 and 4.37/1,000 persons from the Sample Cohort, showing a decreasing trend. The 10-year cumulative incidence of alcoholic liver disease was 5/100 persons in total, 3/100 persons in the low intake group, 5/100 persons in the middle intake group, and 11/100 persons in the high intake group. The incidence of chronic hepatitis and diabetes showed a U-shaped relationship with alcohol intake. The transition from chronic hepatitis to cirrhosis or liver cancer was not associated with alcohol intake. However, the development of complications among diabetics was significantly higher in the high alcohol intake group.

The prevalence and incidence of alcohol-related diseases were very low in this study. Underestimation is possible due to the ambiguous diagnostic criteria and low motivation from individuals to seek medical attention. Common chronic diseases such as chronic liver disease and diabetes could highly increase the burden by alcohol consumption. To estimate population attributable risk by alcohol, further cohort studies and patient registry studies with accurate measurements of alcohol intake are required to produce refined hazard ratios.

Keywords: Alcohol intake, Alcoholic liver disease, Chronic hepatitis, Diabetes, Incidence, Prevalence, Prognosis

Table 1. Alcohol-relate cause of death

ICD code	Description	ICD code	Description
E24.4	Alcohol-induced pseudo-Cushing's syndrome	K29.2	Alcoholic gastritis
F10	Alcohol related mental, behavioral and neurodevelopmental disorders	K70	Alcoholic liver disease
G31.2	Degeneration of the nervous system due to alcohol	K86.0	Alcohol-induced chronic pancreatitis
G62.1	Alcoholic polyneuropathy	R78.0	Presence of alcohol in blood
G72.1	Alcoholic myopathy	X45	Accidental poisoning by and exposure to alcohol
I42.6	Alcoholic cardiomyopathy	X65	Intentional self-poisoning by and exposure to alcohol
		Y15	Poisoning by and exposure to alcohol, undetermined intent

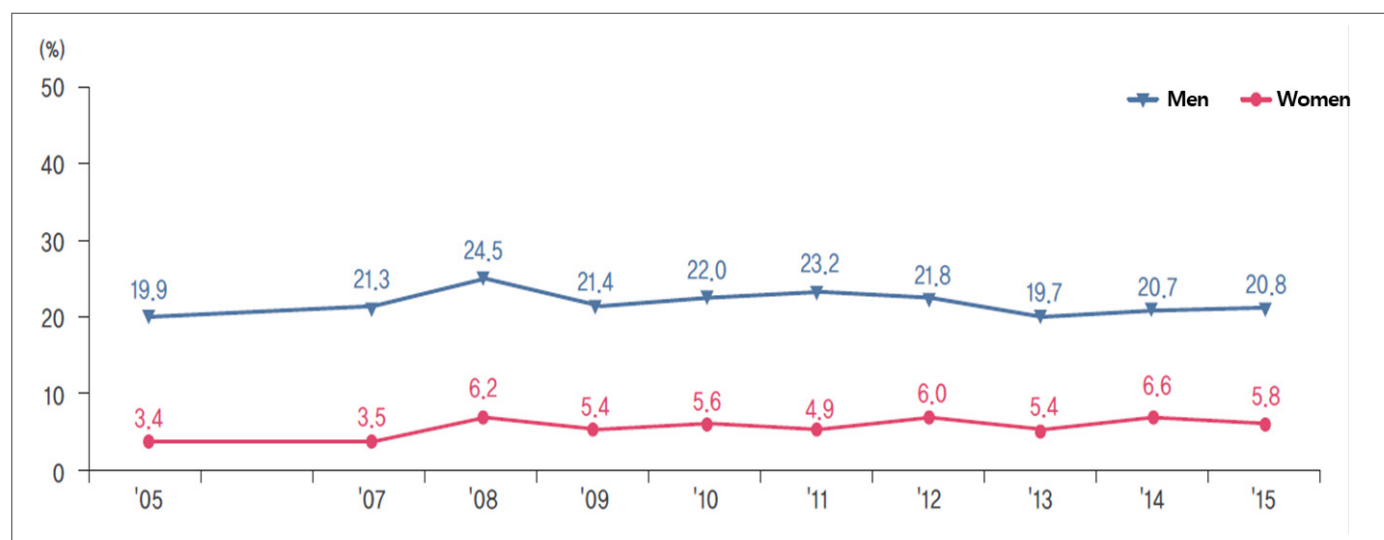


Figure 1. The trend of the prevalence of high risk alcohol consumption from 2005–2015 according to the Korean National Health and Nutrition Survey data

Table 2. Prevalence of alcoholic liver disease from 2003–2013 according to the Sample Cohort Database of the National Health Insurance Services (/1000)

	Year										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Prevalence of Alcoholic Liver Disease	11.76	11.90	12.07	11.36	11.91	11.05	10.20	10.09	10.47	10.52	10.45

Table 3. Prevalence of alcoholic liver disease and other alcohol-related diseases from 2013–2017 according to Korea Health Insurance Review and Assessment (HIRA) data (/1000)

Diseases	Prevalence					
	2013	2014	2015	2016	2017	Average
Alcoholic liver disease (K70)	9.03	8.80	8.86	9.06	9.29	9.01
Alcohol-induced chronic pancreatitis (K860)	0.12	0.13	0.12	0.12	0.12	0.12
Alcohol-induced acute pancreatitis (K852)	0.13	0.14	0.14	0.15	0.15	0.14
Degeneration of the nervous system due to alcohol consumption (G312)	0.03	0.03	0.03	0.03	0.04	0.03
Alcoholic polyneuropathy (G621)	0.07	0.07	0.07	0.07	0.07	0.07
Alcoholic cardiomyopathy (I426)	0.01	0.01	0.01	0.01	0.01	0.01

Table 4. Incidence of alcoholic liver disease from 2003–2013 according to the Sample Cohort Database of the National Health Insurance Services (/1000)

	Year										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Incidence of Alcoholic Liver Disease	9.07	8.06	7.46	6.44	6.70	5.77	5.16	4.78	5.07	4.67	4.37

Table 5. Incidence of alcoholic liver disease and other alcohol-related diseases during 2013–2017 according to the Korea Health Insurance Review and Assessment (HIRA) data (/1000)

Diseases	Prevalence					
	2013	2014	2015	2016	2017	Average
Alcoholic liver disease (K70)	9.03	5.22	4.68	4.49	4.35	4.68
Alcohol-induced chronic pancreatitis (K860)	0.12	0.08	0.07	0.06	0.06	0.07
Alcohol-induced acute pancreatitis (K852)	0.13	0.14	0.14	0.15	0.15	0.14
Degeneration of the nervous system due to alcohol consumption (G312)	0.03	0.02	0.02	0.02	0.02	0.02
Alcoholic polyneuropathy (G621)	0.07	0.04	0.04	0.04	0.04	0.04
Alcoholic cardiomyopathy (I426)	0.01	0.01	0.00	0.00	0.00	0.00

Table 6. Incidence of alcoholic liver disease by alcohol intake group among those who participated in the national health screening in the Sample Cohort Database of National Health Insurance Services from 2003–2013 (/1000 person–years)

Alcohol intake group	Number of incident cases	Incidence	95% Confidence Interval
Low intake (<=1/month)	6,497	2.43	(2.37–2.49)
Middle intake	7,472	4.21	(4.11–4.30)
High intake (>=2/week and >=7 glasses per occasion)	9,466	10.22	(9.99–10.45)

Table 7. Cumulative incidence of alcoholic liver disease by alcohol intake group among those who participated in the national health screening in the Sample Cohort Database of National Health Insurance Services from 2003–2013 (/100)

Alcohol intake group	Years of follow-up												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Low intake (<=1/month)	0.54	1.01	1.43	1.80	2.14	2.43	2.71	2.94	3.14	3.30	3.43	3.52	3.59
Middle intake	0.82	1.59	2.28	2.87	3.43	3.88	4.28	4.63	4.94	5.18	5.40	5.57	5.68
High intake (>=2/week and >=7 glasses per occasion)	2.08	3.68	5.22	6.43	7.54	8.49	9.29	9.94	10.52	10.95	11.31	11.57	11.79
Total	0.86	1.60	2.28	2.85	3.38	3.82	4.22	4.55	4.84	5.07	5.26	5.41	5.52

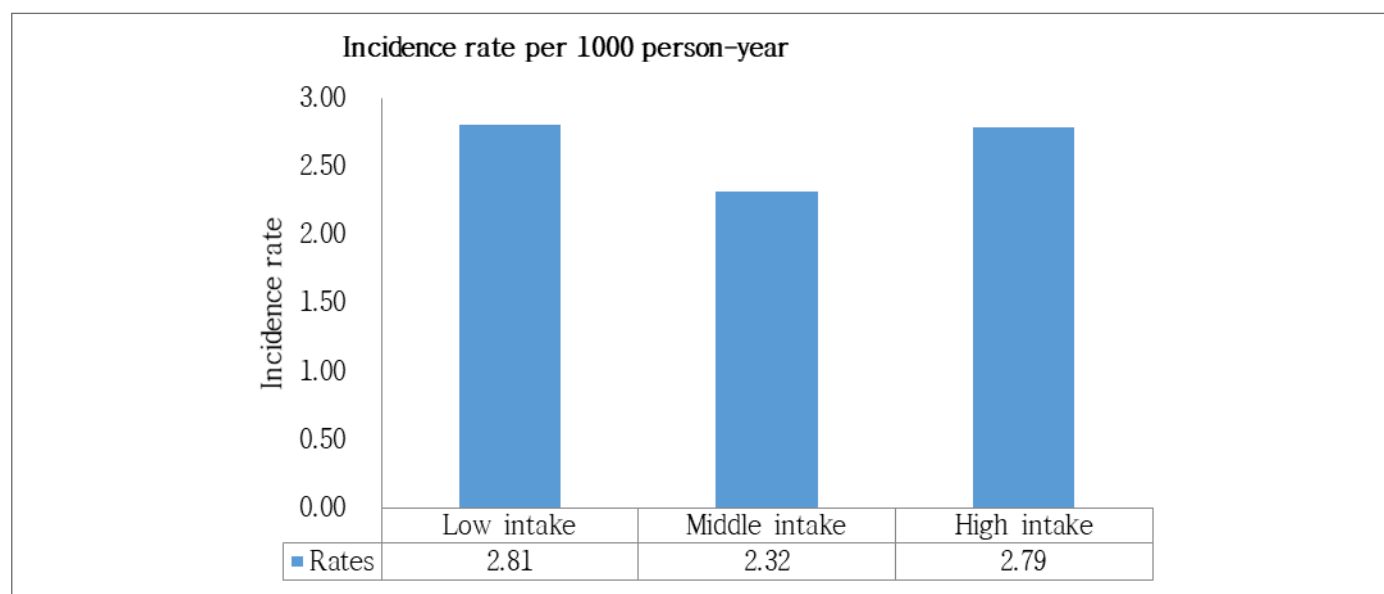
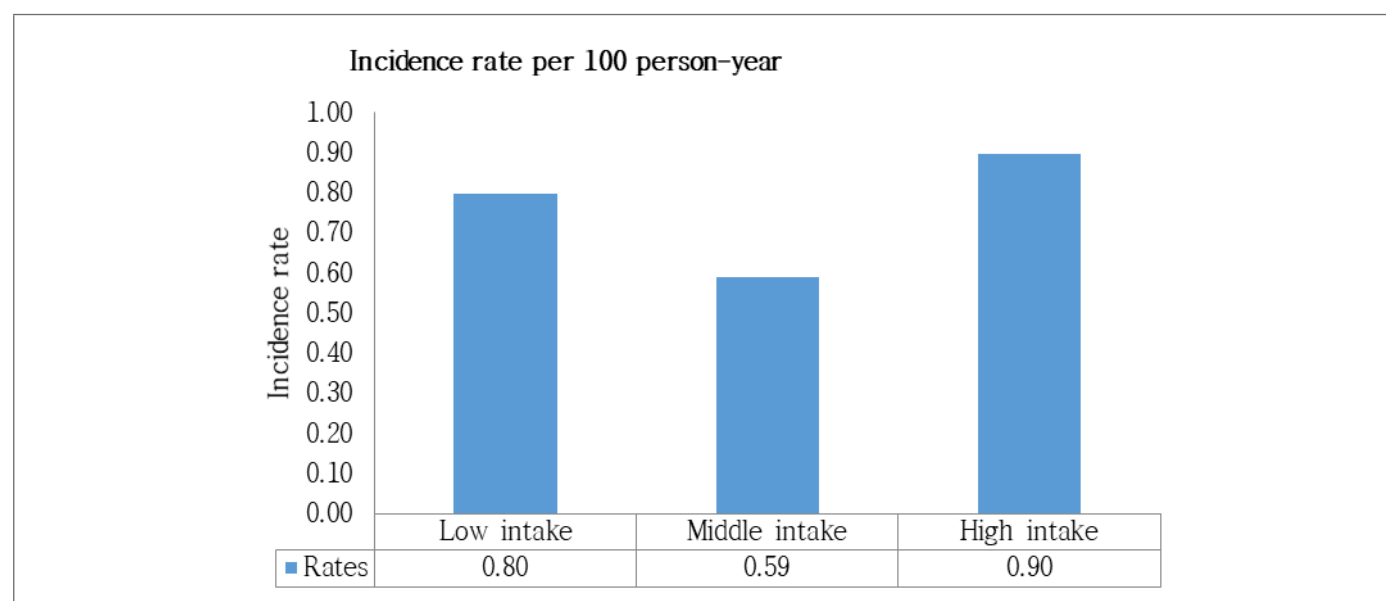
**Figure 2.** Incidence of chronic hepatitis (B18*) by alcohol intake group among those who participated in the national health screening in the Sample Cohort Database of National Health Insurance Services from 2003–2013 (/1000 person–year)

Table 8. Hazard ratios (HR) and 95% confidence intervals of chronic hepatitis for higher alcohol intake groups compared to the low intake group

	Alcohol intake groups		
	low intake	middle intake	high intake
HR of chronic hepatitis	1.00 (ref)	0.92 (0.88–0.96)	1.10 (1.04–1.16)

Adjusted for age, sex, income level, first year of health screening, BMI, systolic blood pressure, cholesterol, and smoking

**Figure 3.** Incidence of diabetes (E10, E11, E13, E14) by alcohol intake group among those who participated in the national health screening in the Sample Cohort Database of National Health Insurance Services from 2003–2013 (/100 person-years)**Table 9.** Hazard ratios (HR) and 95% confidence intervals of diabetes for higher alcohol intake groups compared to the low intake group

	Alcohol intake groups		
	Low intake	Middle intake	High intake
HR of diabetes	1.00 (ref)	0.91 (0.88–0.93)	1.10 (1.07–1.14)

Adjusted for age, sex, income level, first year of health screening, BMI, systolic blood pressure, cholesterol, smoking, and HBV carrier status

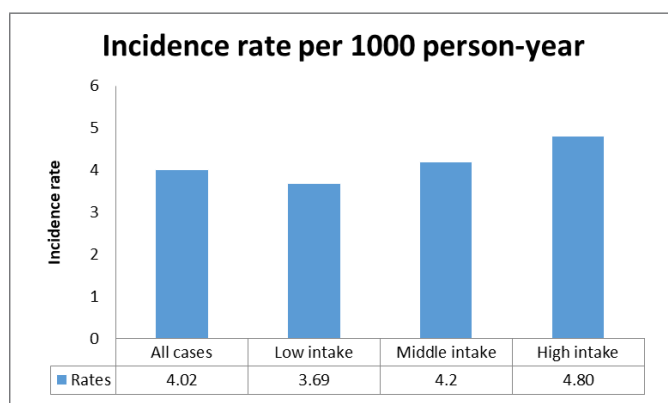


Figure 4. Incidence of liver cirrhosis among chronic hepatitis patients among those who participated in the national health screening in the Sample Cohort Database of the National Health Insurance Services 2003–2013 (/1000 person-years)

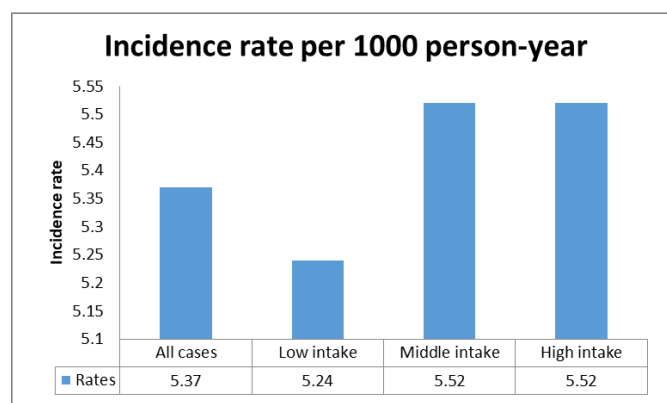


Figure 5. Incidence of liver cancer among chronic hepatitis patients among those who participated in the national health screening in the Sample Cohort Database of the National Health Insurance Services 2003–2013 (/1000 person-years)

Table 10. Hazard ratios (HR) and 95% confidence intervals (CI) of liver cirrhosis and cancer among chronic hepatitis patients for higher alcohol intake groups compared to the low intake group

Prognostic outcomes	Alcohol intake groups		
	Low intake HR (95% CI)	Middle intake HR (95% CI)	High intake HR (95% CI)
Liver cirrhosis	1.00 (ref)	0.96 (0.78–1.19)	0.96 (0.74–1.23)
Liver cancer	1.00 (ref)	0.98 (0.81–1.17)	0.87 (0.69–1.10)

Adjusted for age, sex, income level, and first examination year, body mass index, systolic blood pressure, and total cholesterol, smoking

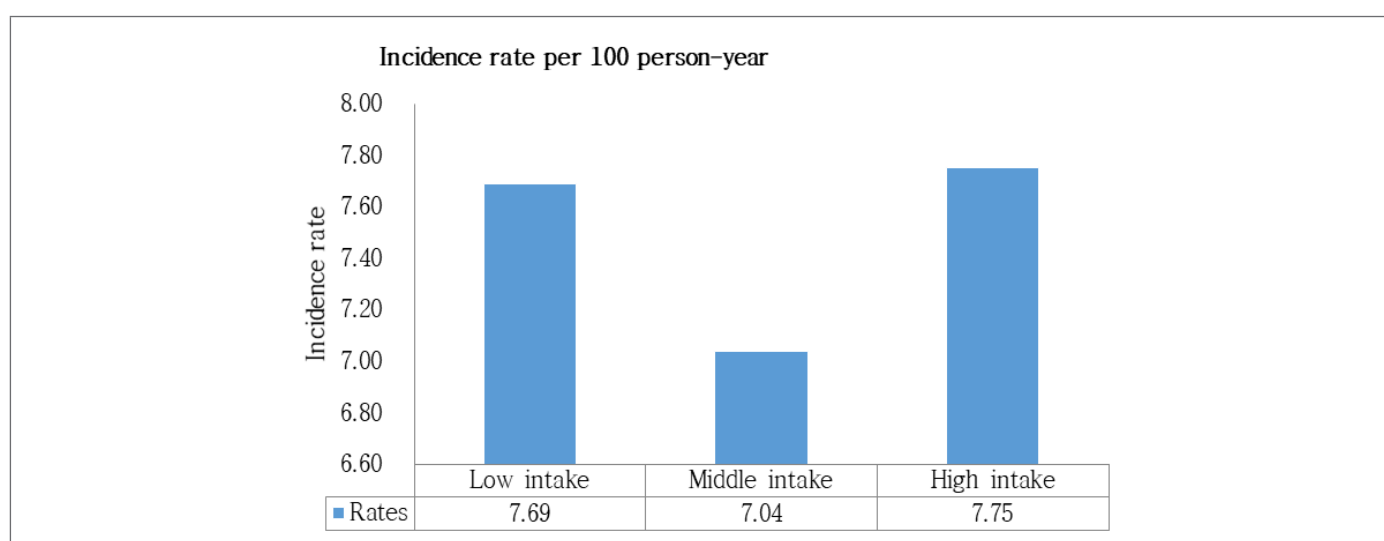


Figure 6. Incidence of complications among diabetes patients among those who participated in the national health screening in the Sample Cohort Database of National Health Insurance Services from 2003–2013 (/100 person-years)

Table 11. Hazard ratios (HR) and 95% confidence intervals (CI) of complications among diabetic patients for higher alcohol intake groups compared to the low intake group

Subgroup	Alcohol intake groups		
	Low intake HR (95% CI)	Middle intake HR (95% CI)	High intake HR (95% CI)
Total*	1.00 (ref)	0.99 (0.95–1.03)	1.09 (1.03–1.14)
Men, ≥60 years old †	1.00 (ref)	0.93 (0.84–1.03)	1.14 (1.02–1.27)
Cardiovascular complication ‡	1.00 (ref)	0.99 (0.94–1.05)	1.09 (1.02–1.16)

*Adjusted for age, sex, income level, and first examination year, body mass index, systolic blood pressure, and total cholesterol, smoking

† Adjusted for age, sex, income level, body mass index, total cholesterol, systolic blood pressure, B-type hepatitis carrier status, and first examination year

‡ Adjusted for age, sex, body mass index, income level, total cholesterol, systolic blood pressure, first examination year, and B-type hepatitis carrier status