

Alcohol Consumption and Hospitalization Burden: Prospective Results from the Moli-sani Study

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Introduction: Few prospective studies have investigated the impact of different alcohol drinking patterns on healthcare systems.

To determine the broad impact of alcohol on health, we sought to assess the dose-response relationship of alcohol intake with all-cause and cause-specific hospitalizations.

Methods: • **Study Population:** The *Moli-sani study* is a population-based cohort study that recruited 24,325 citizens (men and women aged ≥35 years) of the Molise region, an area placed between Central and Southern Italy (March 2005-April 2010).

20,682 initially healthy individuals (48% men) free of CVD or cancer were considered in the analysis.

• **Alcohol intake:** Mean alcohol intake during the year before enrolment was assessed by the validated Italian EPIC-FFQ.

At baseline, participants reported current abstinence but had ever regularly consumed alcohol during the past years were classified as former drinkers.

Table: General characteristics at baseline, according to alcohol categories. Moli-sani Study N. 20,682

	Abstainers	Ex-drinkers	Occasional drinkers	Regular Alcohol Consumption, gr/day				p value [§]
				1-12	12.1-24	24.1-48	>48	
N, (%)	5547 (27)	671 (3)	1329 (7)	4204 (20)	3147 (15)	3738 (18)	2046 (10)	
Age, years*	53±11.2	55.8±11.6	52.9±10.6	52.8±11.3	55.6±11.9	56.4±11.4	56.5±10.6	<.0001
Sex, men, %	19.0	30.1	32.3	41.4	50.8	75.0	96.4	<.0001
Education, %								<.0001
Lower secondary school	53.7	53.4	43.9	41.9	48.0	54.1	65.9	
High school or higher	46.3	46.7	56.1	58.1	52.0	45.9	34.1	
Income, %								<.0001
≤40,000 €/year	57.9	57.4	53.7	56.0	55.3	59.0	60.5	
>40,000 €/year	9.0	12.7	13.8	16.3	14.9	13.3	8.1	
Non-respondents	33.1	29.9	32.5	27.7	29.7	27.7	31.4	
Smoking, %								<.0001
Never	62.6	55.7	54.5	52.8	50.8	38.2	24.8	
Current	20.5	23.7	24.1	23.8	22.3	26.7	32.9	
Former	16.9	20.6	21.4	23.4	26.9	35.1	42.3	
BMI, Kg/m ² *	28.5±5.4	28.3±5.3	28.1±5.0	27.9±4.7	27.4±4.40	27.5±4.1	28.0±4.2	<.0001
HDL, mg/dL*	54.5±15.0	53.7±14.3	56.4±15.5	56.4±14.7	57.7±15.0	60.2±14.4	62.9±14.5	<.0001
Energy intake, Kcal/day*	1965±574	1997±577	1939±548	2079±582	2134 ±564	2281±595	2670±669	<.0001

*mean± standard deviation for age and gender adjusted; §p values age and gender adjusted.

• **Hospitalization:** Hospitalizations were identified by direct linkage with the regional registry of hospital discharge records until December 2013.

Cause-specific hospitalizations were assigned by the ICD9 code of the primary admission diagnosis. Four main outcomes have been studied: hospitalization for all-causes, for alcohol-related diseases, for overall vascular diseases and for any cancer.

• **Statistical Analysis:** Incidence rate ratios (IRR) of multiple hospitalization according to alcohol drinking habits (in categories) were estimated by Poisson regression (fig. 1).

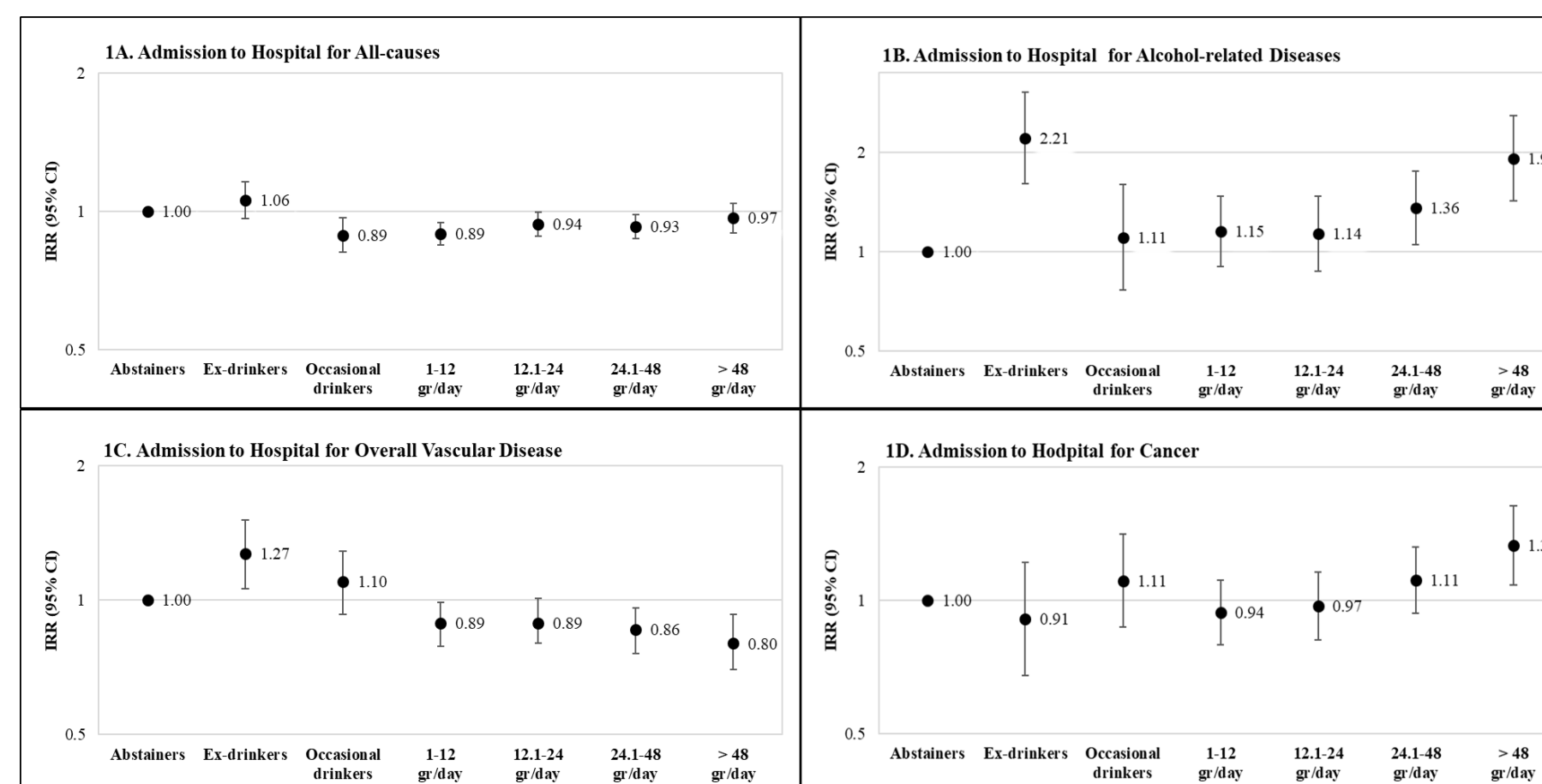
Potential nonlinear relationships were tested via a restricted cubic spline (fig. 2), after the exclusion of former and occasional drinkers.

The analyses were performed by SAS 9.4 for Windows (SAS Institute Inc).

Results: During a median follow-up of 6.3 years, 12,996 hospital admissions occurred.

In multivariable analyses, occasional consumption and intake up to 48 gr/day were associated with a lower risk of all-cause hospitalization than was abstinence (fig. 1A).

Figure 1. IRR for hospitalization according to alcohol categories in Moli-sani Study



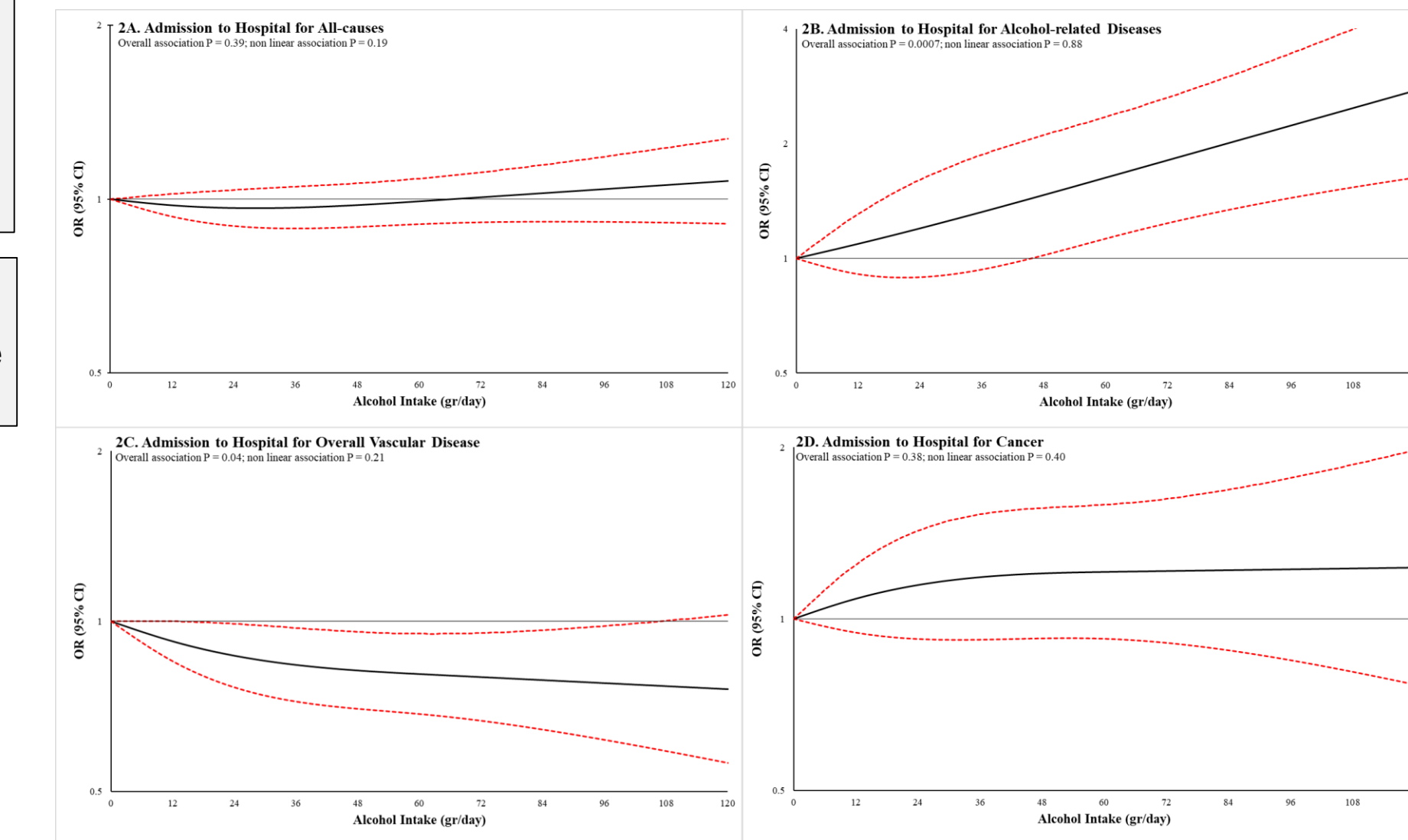
Model is adjusted for age, sex, BMI, education, income, residence, smoking habits, intensity of smoking, duration of smoking, diabetes, HTN GP diagnosis, HCL GP diagnosis, heart failure, liver disorder, haematological disorder, lung disease, gastrointestinal disease, moderate/severe kidney dysfunction, energy intake, Mediterranean diet score (no alcohol contribution), walking, total cholesterol, glucose, SBP, aspirin use, treatment for HTN, treatment for HCL.

Excessive alcohol consumption (>48 gr/day) was associated with a higher risk of hospitalization for alcohol-related diseases (IRR: 1.92, 95% CI: 1.43-2.59, fig 1B) and for cancer (IRR: 1.33, 95% CI: 1.08-1.63, fig 1D).

Former drinkers were at higher risk for vascular and alcohol-related hospitalization (fig 1B,C).

There was a roughly dose-dependent inverse association with lower risk of hospitalization for vascular disease (Fig 2C).

Figure 2. Restricted cubic spline regression for the association between alcohol intake and hospitalization



During follow-up, the 12,996 admissions had a mean duration of hospitalization of 7.3±7.6 days (median 5 days), accounting for over 95,000 hospital-days.

Compared to abstinence, occasional, ≤12 gr/day and 24.1-48 gr/day of alcohol drinkers accumulated significant fewer total hospital days (-5.3%, P=0.001; -4.5%, P<.0001; and -2.4%, P=0.03, respectively) whereas ex-drinkers had more such days (+23.7%, P<.0001).

Conclusions: Moderate alcohol consumption had a modest but complex impact on total hospitalization burden (considering both the total number of hospitalizations and total hospital days) overall.

Heavier alcohol consumption was associated with an increased risk of hospitalization for alcohol-related diseases and for cancer.

These estimates highlight the healthcare burden imposed by varying levels of alcohol intake, with no evidence of greater burden with intake that remains within recommended limits but a greater burden for intake that exceeds established guidelines.

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