Moderate Consumption of Beer

Subjects: Allergy

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There is growing interest in the potential health-related effects of moderate alcohol consumption and, specifically, of beer. This entry provides an assessment of beer-associated effects on cardiovascular and metabolic risk factors to identify a consumption level that can be considered “moderate”.

It introduced all prospective clinical studies and systematic reviews that evaluated the health effects of beer published between January 2007 and April 2020. Five of six selected studies found a protective effect of moderate alcohol drinking on cardiovascular disease (beer up to 385 g/week) vs. abstainers or occasional drinkers. Four out of five papers showed an association between moderate alcohol consumption (beer intake of 84 g alcohol/week) and decreased mortality risk. We concluded that moderate beer consumption of up to 16 g alcohol/day (1 drink/day) for women and 28 g/day (1–2 drinks/day) for men is associated with decreased incidence of cardiovascular disease and overall mortality, among other metabolic health benefits.

alcohol moderate drinking

1. Introduction

In recent years, there has been an increasing interest in the potential health-related effects of moderate alcohol consumption. Although the harmful effects of excessive alcohol use are well established, the association of low-to-moderate alcohol consumption with health-related benefits is still controversial, since the results of available studies are not homogeneous and reaching clear conclusions is challenging. This lack of consensus is observed in alcohol consumption guidelines published in the last five years, which use different terminology (“risky drinking”, “moderate consumption”, or “low-risk drinking”) as well as different drinking thresholds [1][2][3][4][5][6] (Table 1). Furthermore, other variables, such as differences in concentrations of non-alcoholic components (i.e., polyphenols), may confound the beneficial effects of specific alcoholic drinks [7][8].

Table 1. Low-risk drinking guidelines.

Guidelines	1 SDU = g Pure Alcohol	Term	Daily [a,b] (g Alcohol)	Weekly [a,b] (g Alcohol)
Spain. 2016 Socidrogalcohol consensus on alcohol in Primary Care [2]	1 SDU = 10 g Wine: 1 glass Beer: 1 beer (≈200 mL) Spirits: 25 g	Risky consumption (starting at)	Women: 20 g Men: 40–60 g	Women: 140 g Men: 280 g

Guidelines	1 SDU = g Pure Alcohol	Term	Daily [a,b] (g Alcohol)	Weekly [a,b] (g Alcohol)
Spain. 2019 Update Dietary Guidelines for the Spanish population [3]	1 SDU = 10 g	Moderate consumption (upper limit)	Women: <20 g Men: <40 g	- -
UK. 2016 UK Chief Medical Officers' Low Risk Drinking Guidelines [4]	1 SDU = 8 g Wine: 1 glass (125 mL) (11% ABV)	Low-risk drinking (upper limit)	- -	Women: 112 g Men: 112 g
USA. 2015 Dietary guidelines [5]	1 SDU = 14 g Wine: 5 fl oz or 147.9 mL (12% ABV) Beer: 12 fl oz or 354.9 mL (5% ABV) Spirits: 1.5 fl oz or 44.4 mL (40% ABV)	Moderate drinking (upper limit)	Women: 14 g Men: 28 g	- -
Canada. 2018 Canada low-risk alcohol drinking guidelines [6]	1 SDU [c] ≈ 13 g Wine: 142 mL (12% ABV) Beer: 341 mL (5% ABV) Spirits: 43 mL (40% ABV)	Recommended limit	- -	Women: 130 g Men: 210 g
37 countries. 2016 [1]	1 SDU = 8–20 g	Low-risk drinking (upper limits range)	Women: 10–42 g Men: 10–56 g	Women: 98–140 g Men: 150–280 g

mption in Europe was 72 L per capita, with a few countries (Czech Republic, Austria, and Germany) consuming more than 100 L per capita per year [9]. However, patterns of consumption differ across the region varying from predominantly meal-associated drinking in Mediterranean countries, to high rates of heavy episodic drinking in Central and Eastern Europe, and relatively frequent consumption both with and outside of meals in Central Western Europe [10].

Beer is mainly composed of water, but it is also rich in nutrients—carbohydrates, amino acids, minerals, vitamins, and polyphenols—resulting from a multi-step brewing and fermentation process [7][11][12][13]. Hop flowers, used as a bittering and flavoring agent [14], contain phenolic compounds, including prenylated flavonoids [15][16], which have been shown in vitro to have different antioxidant, anticarcinogenic, anti-inflammatory, oestrogenic, and antiviral biological activities [7][17]. Xanthohumol is the most abundant of these compounds and, in addition to potential bioactivity [7][18], it also inhibits platelet activation without increasing the bleeding risk [19]. Thus, brewing processes have been optimized to achieve the highest possible content of xanthohumol [20]. Regarding antioxidant content, ale beers have been reported to display a higher antioxidant activity than lager beers due to the higher fermentation temperature in the brewing process. However, despite these enrichment processes, controversy remains as to the bioavailability of the phenolic compounds in beer [21][22][23].

Alcohol content in regular beers varies between 3% and 6% alcohol by volume [11]. There is vast scientific literature on excessive alcohol consumption. Indeed, chronically high alcohol intake acts as a toxin to the heart and vascular system and may also exacerbate pre-existing heart disorders. However, low-to-moderate amounts of alcohol intake might have beneficial effects on the cardiovascular (CV) system, since it increases high-density lipoprotein cholesterol (HDL) and reduces arterial stiffness (both effects shown specifically with beer) [21][22][24][25], and also decreases fibrinogen, platelet activation and aggregation, as well as blood oxidative stress and inflammatory parameters [26][27][28]. The alcohol content of beer might also have an effect on glucose homeostasis [29]. Alcohol contributes to total calorie intake and may increase weight when consumed in excess [30][31]. Non-alcoholic components also contribute to the energy content of beer. Thus, Public Health England lists the mean energy content of alcohol-free beers at seven kilocalories/100 g [32]. Overall, 28% of the total monthly kilocalories contributed by beer among regular drinkers derive from its non-alcoholic ingredients [33].

Taken together, the biological activity of phenolic compounds in beer and the possible association of alcohol intake with mortality, CV risk [34][35][36], and glucose metabolism [37][38][39][40][41][42][43] may contribute to the putative health-related effects of moderate beer consumption. Conversely, excess beer consumption may be associated with weight increase and associated morbidities [30].

2. Moderate Beer Consumption and Mortality

A summary of related studies is shown in Table 2. The systematic review by de Gaetano et al. [34] suggested that a J-shaped relationship also exists between beer consumption and all-cause mortality. The lowest mortality risk was observed in subjects with low to moderate alcohol consumption compared to abstainers or heavy drinkers, with the lowest risk at beer consumption of 84 g alcohol/week [34].

Table 2. Summary of main mortality studies.

Study Funding/COI [a]	Design (Mean/Median Years of Follow-Up)	*n* (Women)	Categories of Alcohol Consumption/Type of Drink	Variable/s	Reference Group (HR = 1)	Outcomes/Conclusions [b]
de Gaetano et al., 2016 [34] **Assobirra**, the Italian Association of the Beer and Malt Industries/ Some authors were consultants for the Web Newsletter of Assobirra,	Systematic review		Wine, beer, and spirits	All-cause mortality		Evidence suggests a J-shaped relationship between alcohol consumption and total mortality, with lower risk for moderate alcohol consumers than for abstainers or heavy drinkers. Specific data on beer are not conclusive, although some results indicate a positive role of drinking beer in moderation (1

Study Funding/COI [a]	Design (Mean/Median Years of Follow-Up)	*n* (Women)	Categories of Alcohol Consumption/Type of Drink	Variable/s	Reference Group (HR = 1)	Outcomes/Conclusions [b]
or were on the board/received lecture fees from Fundación Cerveza y Salud, FIVIN, the Beer and Health Foundation, ERAB, or **Cerveceros de España.**						drink/day, about 12 g of ethanol) against mortality for any cause
	1 meta-analysis of 34 prospective studies [44]	Over 1 million adults	Low to moderate Women: 1 drink/day. Men: 2 drinks/day / Wine, beer, and spirits	All-cause mortality		Low to moderate consumption of alcohol significantly reduces total mortality, while higher doses increase it
	1 Prospective cohort [45] (12–18 y)	36,250 men	Wine and beer	CV death All-cause mortality	Non-drinkers	Moderate wine or beer drinking reduced the risk of CV death. Only moderate wine drinking was associated with lower all-cause mortality: RR: 0.67 (0.58 to 0.77; $p < 0.001$)
	1 Prospective cohort [46] (16.8 y)	7735 British men 40–59 y old	1 SDU: Half pint beer (8–10 g alcohol). Frequency: Non-drinkers; Occasional (1–2 SDU/month); Weekend drinkers; Daily or on most days. Quantity: 1–2, 3–6, >6 / Wine, beer, and spirits	All-cause mortality	Occasional drinkers	Regular beer drinking [HR: 0.84 (0.71 to 1.01)] showed no significant difference vs. occasional drinking
	1 Prospective cohort [47] Copenhagen City Heart Study (25 y)	14,223 adults	1 SDU: 1 bottle beer (12 g alcohol). Never, Hardly ever, Monthly, Weekly Daily: 1–2 SDUs Daily: >2 SDUs / Wine, beer, and spirits	All-cause mortality	Never beer drinkers	In men, monthly beer intake (RR: 0.86 (0.77 to 0.97)) was associated with lower mortality, and daily intake >2 beers (RR: 1.14 (1.02 to 1.27)) to increased risk. In women the associations were not statistically significant: Monthly beer intake (RR: 0.98 (0.88 to 1.08)), and

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						daily intake >2 beers (RR: 1.31 (0.92 to 1.88)) At a medium education level, monthly beer intake was associated with lower risk (RR: 0.87 (0.77 to 0.97)), and at low [RR:1.20 (1.07 to 1.34) and medium education level (RR:1.18 (1.02 to 1.37)), >2 beers daily was associated with increased risk.
	1 Prospective cohort [48] (12.6 y)	380,395 adults (247,795 women)	For beer: Never. Light: 0.1–2.9 g/day, 3–9.9 g/day, 10–19.9 g/day, 20–39.9 g/day (only for men). ≥20 g/day (extreme for women) ≥40 g/day (extreme for men) / Wine and beer	All-cause mortality	Light consumers (0.1–2.9 g/day)	In women: Compared to low-level consumers, lifetime non-drinkers (HR: 1.06; 1.02 to 1.12), and consumers of beer at amounts ≥3 g/day displayed significantly higher overall mortality risk. In men: Lifetime non-drinkers (HR: 1.07; 0.98 to 1.16) and consumers of 3–9.9 g/day (HR: 1.04; 0.98 to 1.10) showed no significant differences compared to light consumers. Consumers of beer amounts ≥10 g/day displayed a significantly higher overall mortality risk.
Stockwell et al., 2016 [49] None declared	Systematic review/meta-analysis of 87 studies (13.4 y)	3998,626 adults	Abstainer. Former drinker. Occasional: <1.30 g/day. Low: 1.30 to <25 g /day. Medium: 25 to <45 g/day High: 45 to <65 g/day. Higher: ≥65 g/day	All-cause mortality	Abstainer OR occasional drinker	**Standard adjustment**: Significant protective effect for low-volume (RR: 0.86 (0.83 to 0.90); $p < 0.0001$) and occasional drinkers (RR: 0.84 (0.79 to 0.89); $p < 0.0001$) as compared with abstainers. Abstainers were at

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			/ Alcohol in general			significantly higher risk (RR: 1.19 (1.12 to 1.27); $p < 0.0001$) as compared to occasional drinkers. **Full adjustment**: No significant protection was estimated for occasional (RR: 0.95 (0.85 to 1.05)), low-volume (RR: 0.97 (0.88 to 1.07)), or medium-volume drinkers (RR: 1.07 (0.97 to 1.18)) as compared with abstainers.
Xi et al., 2017 [50] None declared	Population survey data linked to mortality data (8.2 y)	333,247 adults	1 SDU: 14 g alcohol. Lifetime abstainers. Lifetime infrequent drinkers. Former drinkers. Current light drinkers. Moderate: >3 to ≤14 drinks/w for men or >3 to ≤7 drinks/w for women. Heavy drinkers. Binge drinking / Alcohol in general	All-cause, cancer, or CVD mortality.	Lifetime abstainers	All cause-mortality: Decreased for Light (HR 0.79 (0.76 to 0.82)) and Moderate (HR 0.78 (0.74 to 0.82)) drinkers. Increased in Heavy: HR: 1.11 (1.04 to 1.19) and binge (HR: 1.13 (1.04 to 1.23)) drinkers. CVD-specific mortality: Light: HR 0.74 (0.69 to 0.80); Moderate: HR 0.71 (0.64 to 0.78)
Bell et al., 2017 [51] National Institute for Health Research, Welcome Trust, the Medical Research Council prognosis research strategy Partnership and other government [51][50]	Prospective cohort (6 y)	1937,360 (51% women)	1 SDU [c]: 8 g Non-drinkers. Former drinkers Occasional drinkers: drinks rarely or occasionally. [49] Moderate: Men: 21 SDU/w or 3 SDU/day. Women: 14 SDU/w or 2 SDU/day Heavy drinkers [51] / Alcohol in general	CV death and all-cause mortality	Moderate drinkers	Non-drinkers (former and occasional drinkers removed) had an increased risk of CV death (HR: 1.32 (1.27 to 1.38)) and all-cause mortality (HR: 1.24 (1.20 to 1.28)). [34][52]

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Gender Differences

In the EPIC study, beer consumption in women was more strongly related than wine consumption to overall mortality for amounts >21 g/week compared with the reference category (0.7–20.3 g/week) [48]. On the other hand, in the study by Xi et al., the protective effect of low and moderate alcohol consumption against all-cause and CV disease (CVD) mortality was more pronounced in women [50]. Thus, it seems that women may be both more sensitive to the protective effects against mortality of moderate beer intake and to the risk effects of higher amounts.

Study Funding/COI [a]	Design (Mean/Median Years of Follow-Up)	*n* (Women)	Categories of Alcohol Consumption/Type of Drink	Variable/s	Reference Group (HR = 1)	Outcomes/Conclusions [b]
health-related agencies.						
Suadicani, 2008 [52] The King Christian X's Foundation, The Danish Medical Research Council, The Danish Heart Foundation, and The Else & Mogens	Prospective cohort (16 y)	3022 Caucasian males 53–74 y old	1 SDU: 10–12 g ethanol / Wine, beer, and spirits	All-cause and IHD-related death within the different blood phenotypes	Alcohol abstainers (comparison only for wine drinkers)	For beer, the median (P_{20}, P_{80}) number of drinks/week among those with the non-O phenotype was significantly higher in those who died (overall mortality): 10.5 (0, 15.5) vs 7.5 (0, 10.5); $p \leq 0.001$. The effect of wine intake on all-cause mortality among middle-aged and elderly men may depend on ABO phenotypes. Among non-O

Study Funding/COI [a]	Design (Mean/Median Years of Follow-Up)	*n* (Women)	Categories of Alcohol Consumption/Type of Drink	Variable/s	Reference Group (HR = 1)	Outcomes/Conclusions [b]
Fresan et al., 2016 [53] The Spanish Ministry of Health, the Navarra Regional Government, and the University of Navarra.	Prospective cohort (4 y)	15,765 adults	Beverages groups: Water, low/non-caloric beverages (diet soda beverages, coffee without sugar), milk, juice, and sugared coffee (dairy products, juices, coffee with sugar). Occasional consumption (SSSBs and spirits). Wine, beer	Change in BW and new-onset obesity	No substitution	Substitution of one beer with one serving of water per day at baseline was related to a lower incidence of obesity (OR 0.81, 95%CI 0.69 to 0.94 and OR 0.84, 95%CI 0.71 to 0.98, when further adjusted for the consumption of other beverage groups) and to higher weight loss (−328 g, 95%CI −566 to −89).
Bendsen et al., 2013 [55] **The Dutch Beer Institute** (funded by the Dutch Brewers)/ Three of the authors are employed by or are board members of the Dutch Beer Institute.	Systematic review of 35 observational studies and 12 experimental studies Meta-analyses: 14 observational studies (11 cross-sectional and		1 SDU beer = 330 mL, 4.6% alcohol = 12 g/drink. / Beer	BW increase, BMI, and abdominal obesity (WC and WHR)	Control: Non-drinkers or in the absence of non-drinkers, the group with the lowest beer intake Low or non-	Dose-response graphs: High beer intake (>4 L/w) was associated with a higher degree of abdominal obesity in men. Quantitative synthesis: High beer consumption (about 1000 mL/day; 5% alcohol) did not result in increased BW compared with control groups but did result in increased BW compared with low-

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	3 prospective) included in dose-response graphs. 10 intervention studies (6 beer vs non-alcoholic beer and 4 beer vs control) included in quantitative synthesis				alcoholic beer	or non-alcoholic beer groups (mean difference 0.73 kg, 95% CI: 0.53 to 0.92; z = 7.39, p < 0.0001, I2 = 0%)
Schütze et al., 2009 [54] The German Cancer Aid, the German Federal Ministry of Education and Research and the European Union.	Prospective cohort (8.5 y)	20,625 (12,749 women)	WOMEN: No beer. Very light: >0 to <125 mL/day. Light: ≥125 to <250 mL/day. Moderate: ≥250 mL/d MEN: No beer. Very light: >0 to <250 mL/day. Light: ≥250 to <500 mL/day. Moderate: ≥500 to <1000 mL/day Heavy: ≥1000 mL/day / Beer	WC change BW change	Very light	MEN: Moderate beer consumption showed significant lower relative odds for WC loss (OR 0.44, 95%CI 0.24 to 0.80) WOMEN: Although beer-abstaining women showed significantly lower relative odds (OR.0.88; CI 0.81, 0.96) for WC gain compared with their very-low-level-drinking counterparts, significance was lost once the model was adjusted by HC change; however, the new OR was on the border of significance (OR.0.91; CI 0.83, 1.00)
Padro et al., 2018 [56] **Fundacion Cerveza y Salud, Madrid, Spain; The European Foundation for Alcohol**	Open-label, prospective randomized, two-arm, longitudinal cross-over	36 (15 women)	WOMEN: 330 mL/day normal or non-alcoholic beer (15 g/day or 0 g/day alcohol) MEN: 660 mL/day normal or non-alcoholic beer (30 g/day or 0	BMI T2D Lipid Profile		Moderate beer consumption (traditional or alcohol-free) does not increase body weight in obese healthy individuals or have negative effects on the vascular system. Moderate consumption was associated with

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Research; Spanish Ministry of Economy and Competitiveness of Science; Institute of Health Carlos III.			g/day alcohol) / Beer			reduced risk of dyslipidemia, increased anti-oxidative properties of high-density lipoprotein, and increased efflux of cholesterol.
Polsky et al., 2017 [57] None declared	Systematic Review of 96 studies	18 studies included more than 10,000 subjects each.	Alcohol in general			Moderate alcohol consumption generally reduces diabetes risk.
Cullman et al. 2012 [43] The Swedish Research Council; the Swedish Diabetes Association; the Swedish Council of Working Life and Social research; and Novo Nordisk Scandinavia.	Prospective cohort (8–10 y)	5128 adults (3058 women) with normal glucose tolerance and 111 (41 women) with pre-diabetes. 35–56 y old	Abstainers Total alcohol Occasional: 0.01–1.49 g/day in women, 0.01–6.79 g/day in men. Low: 1.50–4.71 g/day in women, 6.80–13.01 g/day in men. Medium: 4.72–8.75 g/day in women, 13.02–22.13 g/day in men. High: ≥8.76 g/day in women, ≥22.14 g/day in men Wine Occasional: ≤0.32 g/day in women, ≤0.99 g/day in men. Medium: 0.33–1.65 g/day in women, 1–4.99 g/day in men. High: ≥1.66 g/day in women, ≥5 g/day in men Beer (only in men) Occasional: ≤0.99 g/day. Medium: 1–4.99 g/day. High:	PreD T2D PreD + T2D	Occasional drinkers	Normal glucose tolerance at baseline MEN: High alcohol: Higher risk of preD + T2D (OR 1.42, 95% CI 1.00–2.03). High beer: Higher risk of preD + T2D (OR 1.63, 95% CI 1.07–2.48) and higher risk of preD (OR 1.84, 95% CI 1.13–3.01) Abstainers vs occasional wine or beer drinkers: Higher risk of preD + T2D (OR 2.01, 95%CI 1.01–3.98 and OR 2.13, 95%CI 1.03–4.39, respectively). WOMEN: High wine: lower risk of preD (OR 0.66, 95% CI 0.43–0.99) Normal glucose tolerance or preD at baseline WOMEN: Low alcohol: Lower risk of T2D (OR 0.41, 95% 0.22–0.79). Medium wine: Lower risk of T2D (OR 0.46, 95%CI 0.24–0.88)

Study Funding/COI [a]	Design (Mean/Median Years of Follow-Up)	*n* (Women)	Categories of Alcohol Consumption/Type of Drink	Variable/s	Reference Group (HR = 1)	Outcomes/Conclusions [b]
			≥5 g/day / Wine, beer and spirits			
Yin et al., 2011 [58] National Health and Medical Research Council of Australia, Tasmanian Government and Royal Hobart Hospital Acute Care Programme.	Prospective cohort (2 y) [60]	862 (49% women) Mean age 63 y, range 51–81	[43][57] 1SDU: 10 g alcohol Frequency: Never, <once a month, 1–3 days/month, 1/2/3/4/5/6 days /wk, every day. Amount 30mL spirits: 1 glass. 1 can beer: 2 glasses. 1 bottle wine (750 mL): 6 glasses. 1 bottle sherry (750 mL): 12 glasses. g/day / Wine, beer, and spirits	BMD [61][62] change	[59]	Total alcohol intake in men positively predicted change in BMD at the lumbar spine and hip (beta = 0.008% and 0.006% per year per gram of alcohol intake, $p < 0.05$). The frequency of drinking red wine was positively associated with percentage change in BMD at the lumbar spine in men (beta= 0.08% per year per class, p= 0.048). At baseline, lumbar spine BMD was positively associated with frequency of low-alcohol beer drinking in women (beta = 0.034 g/cm(2) per category, p = 0.002).
Mukamal et al., 2007 [59] The National Heart, Lung, and Blood Institute. The National Institute on Ageing.	Prospective population-based cohort study (12 y If no hip fracture 7.5 y If hip fracture) [8][66]	5865 ≥60 y	1 SDU: 12-ounce can or bottle of beer, 6-ounce glass of wine, and 1 shot of liquor. 1 SDU[c] = 14 g Categories Long-term abstainers, former drinkers, <1 drink/w, 1–6 drinks/w, 7–13 drinks/w, ≥14 drinks/w / Wine, beer, and spirits	Hip fracture BMD	[58] Long-term abstainers [65]	[59] Strong, graded, positive relationship between greater alcohol consumption and greater BMD up to 13 drinks/week. [63] J-shaped relationship between alcohol intake and risk for hip fracture (quadratic trend: p = 0.02), with lower HRs in intermediate drinking categories. Drinking <1 beer/w showed a significantly lower risk of hip fracture (HR 0.66, 95%CI 0.44–0.99).

With regard to obesity, the study by Schütze et al. [54] suggested that only men observe a risk for an increase in waist circumference (WC) with beer consumption of >500 mL/day. In women, beer-abstainers showed lower relative odds for WC gain compared with their very low-level drinking counterparts (1 to <125 mL/day), which was close to significance.

Similar gender differences were seen in the diabetes studies. Cullman et al. found that alcohol effect on glucose metabolism was different between men and women [43], depending on amounts of consumption and alcohol type;

overall, in individuals with normal glucose tolerance, a decrease in T2DM risk was observed in occasional consumers of beer and wine vs abstainers among men, and in high consumers (≥192 g/week) of wine vs occasional consumers among women. This cohort study showed that men who were high consumers of beer and had baseline normal glucose tolerance had a significantly increased risk of developing abnormal glucose regulation (OR 1.63, CI 1.07–2.48 for pre-diabetes plus T2DM and OR 1.84, CI 1.13–3.01 for pre-diabetes) compared to occasional drinkers [43]. Men abstainers had a significantly higher risk of developing abnormal glucose regulation (OR 2.13, CI 1.03–4.39) than occasional beer drinkers, suggesting occasional beer consumption may be protective in men. Data for beer consumption in women were not provided in the Cullman et al. study. When considering individuals with normal glucose tolerance or pre-diabetes at baseline, the only significant difference found when using occasional drinking as a reference was the case of women with low consumption of total alcohol, who showed a decreased risk of T2DM (OR 0.41, CI 0.22–0.79). Most studies reviewed by Polsky et al. [57] also showed differences between men and women. In one study, a lower risk for T2DM was only observed in women who consumed alcohol (any quantity; no dose-relationship observed) compared to lifetime abstainers, but this was not found in men [67]. Another study showed that in men alone, a moderate alcohol consumption (10–14.9 g/day) was associated with a reduced risk of T2DM with respect to very low consumption (0.01–4.9 g/day), linked to wine consumption [68].

Regarding BMD, the study by Yin et al. [58] found that alcohol intake was positively associated only in men with an increase in the percentage of spinal and hip BMD after two years, whereas in women, lumbar spine BMD at baseline was positively associated with frequency of low-alcohol beer consumption (beta = 0.034 g/cm^2 per category, p = 0.002).

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