3. Recommendations on alcohol consumption

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Abstract

Objective: To provide updated, evidence-based recommendations concerning the effects of alcohol consumption on the prevention and control of hypertension in otherwise healthy adults (except pregnant women).

Options: There are 2 main options for those at risk for hypertension: avert the condition by limiting alcohol consumption or by using other nonpharmacologic methods, or maintain or increase the risk of hypertension by making no change in alcohol consumption. The options for those who already have hypertension include decreasing alcohol consumption or using another nonpharmacologic method to reduce hypertension; commencing, continuing or intensifying antihypertensive medication; or taking no action and remaining at increased risk of cardiovascular disease.

Outcomes: The health outcomes considered were changes in blood pressure and in morbidity and mortality rates. Because of insufficient evidence, no economic outcomes were considered.

Evidence: A MEDLINE search was conducted for the period 1966–1996 with the terms ethyl alcohol and hypertension. Other relevant evidence was obtained from the reference lists of articles identified, from the personal files of the authors and through contacts with experts. The articles were reviewed, classified according to study design, and graded according to the level of evidence.

Values: A high value was placed on the avoidance of cardiovascular morbidity and premature death caused by untreated hypertension.

Benefits, harms and costs: A reduction in alcohol consumption from more than 2 standard drinks per day reduces the blood pressure of both hypertensive and normotensive people. The lowest overall mortality rates in observational studies were associated with drinking habits that were within these guidelines. Side effects and costs were not measured in any of the studies.

Recommendations: (1) It is recommended that health care professionals determine how much alcohol their patients consume. (2) To reduce blood pressure in the population at large, it is recommended that alcohol consumption be in accordance with Canadian low-risk drinking guidelines (i.e., healthy adults who choose to drink should limit alcohol consumption to 2 or fewer standard drinks per day, with consumption not exceeding 14 standard drinks per week for men and 9 standard drinks per week for women). (3) Hypertensive patients should also be advised to limit alcohol consumption to the levels set out in the Canadian low-risk drinking guidelines.

Validation: These recommendations are similar to those of the World Hypertension League, the National High Blood Pressure Education Program Working Group on Primary Prevention of Hypertension and the previous recommendations of the Canadian Coalition for High Blood Pressure Prevention and Control and the Canadian Hypertension Society. They have not been clinically tested. The low-risk drinking guidelines are those of the Addiction Research Foundation of Ontario and the Canadian Centre on Substance Abuse.

Sponsors: The Canadian Hypertension Society, the Canadian Coalition for High Blood Pressure Prevention and Control, the Laboratory Centre for Disease Control at Health Canada, and the Heart and Stroke Foundation of Canada. The low-risk drinking guidelines have been endorsed by the College of Family Physicians of Canada and several provincial organizations.

High blood pressure affects approximately 1 in 5 adult Canadians and leads to premature cardiovascular disease and death.[1,2] The costs of treating hypertension are high and rising. Nonpharmacologic interventions and lifestyle changes that prevent hypertension and reduce blood pressure may play an important role in reducing morbidity and death related to cardiovascular disease and in moderating treatment costs.[3] Consensus recommendations on lifestyle modifications for the treatment and control of hypertension were formulated by the Canadian Coalition for High Blood Pressure Prevention and Control and the Canadian Hypertension Society

Special supplement

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This article has been peer reviewed.

in 1989.[4] Since then, many randomized controlled studies have been conducted examining the effect of lifestyle interventions on blood pressure.

The consumption of alcohol by adults in Canada is common. Overall, 75% of Canadians over the age of 15 years drink alcohol,[5] and 6.1% of adult Canadians have 15 or more drinks per week.[6] In a 1997 survey of Ontario adults, 25% of men and 10% of women either exceeded recommended weekly intake levels or had more than 2 drinks per day as often as once per week.[7] These limits are considered to represent a low risk of health and other alcohol-related problems.[8]

A number of epidemiologic and clinical studies have addressed the association between alcohol consumption and blood pressure. In light of the high prevalence of both hypertension and alcohol consumption among adults in Canada and the evidence that alcohol contributes to hypertension, the expert panel considered this an important and potentially reversible public health problem.

The primary objective of this guideline is to review the evidence examining the relation between alcohol consumption and blood pressure, including the effects of moderation or abstinence on reducing blood pressure in hypertensive men and non-pregnant women and on preventing hypertension in the general adult population, and to advise health care professionals and the public accordingly. The main health care strategy under examination consisted of the guidelines on low-risk drinking of the Addiction Research Foundation of Ontario and the Canadian Centre on Substance Abuse.[9]

Methods

A complete description of the methods used in developing these recommendations is given in part 1 of this supplement.[10]

The chair and members of the panel were selected by the Organizing Committee of the lifestyle modification recommendations to obtain a spectrum of health care professionals and scientists with expertise and interest in the areas of hypertension and alcohol consumption.

A MEDLINE search was performed using the terms ethyl alcohol and hypertension for English-language studies published between 1966 and 1996. Additional articles were identified by reviewing the reference lists of the identified articles, were found in the personal files of the panel members and were suggested by other experts. The principles for grading the evidence and the recommendations were based on those previously used by the Canadian Hypertension Society[11] and are summarized in part 1 of this supplement.[10] An attempt was made to reach consensus on all recommendations. The evidence and the recommendations were presented for comment to the other expert panels for this guidelines series, submitted for review to major Canadian organizations and presented at an international conference on preventive cardiology, to allow further national and international input. All revisions were reviewed and assessed by the panel before incorporation into the final document. All randomized controlled trials examining the effect of alcohol on blood pressure that were identified through our search were included in the analysis.

To objectively assess the effect of alcohol on blood pressure as indicated by the results of randomized controlled trials, we examined data for blood pressure readings obtained with the patient in the sitting position (or the supine position if a reading for the sitting position was not available) after a 5-minute rest (or the closest time interval longer than 5 minutes if data were not available for 5 minutes). This method most closely approximates the current Canadian recommendations for determining blood pressure.[12,13] We standardized the alcohol content of beverages as reported in the various studies such that one drink was considered to contain 13.6 g of ethanol (approximately the amount of ethanol in 1.5 fluid ounces of 40% spirits, 5 fluid ounces of 12% wine or 12 fluid ounces of 5% beer). Thus, the accuracy of the estimates of alcohol consumption in this review are limited by the methodology used to determine alcohol consumption, as well as by the design and reporting of the various studies.

Results

Effect of alcohol on blood pressure

We found extensive observational data on the association among alcohol consumption, blood pressure, cardiovascular complications, and specific and all-cause mortality rates.[14] In addition, there were 14 randomized controlled trials examining the effect of changes in alcohol consumption on blood pressure.[15–28] However, there were no randomized controlled trials designed primarily to determine the effect of a reduction in alcohol consumption on rates of hypertensive complications or death. Because of ethical considerations, it is impossible to study the effect of increasing alcohol consumption on blood pressure and cardiovascular complications in a randomized controlled study with extended follow-up. Therefore, most studies have taken place over a relatively short period and have been specifically designed to determine the effect of reducing alcohol consumption, usually from high levels.

The results of population cohort[29–47] and cross-sectional[47–96] studies have almost uniformly demonstrated a positive association between levels of alcohol consumption and blood pressure in both men and women. However, many of the studies found that, for people who consumed alcohol at low levels, blood pressure was no different from or was slighter lower than for those who abstained from alcohol use.[33,42,49–51,56,58,59,61,63,68,76,78,80,83,87,89,94,97,98] Other studies have found that the association between alcohol consumption and blood pressure is linear, and some experts have suggested that reductions in blood pressure associated with low levels of alcohol consumption are related to methodologic problems.[52,53,64,71,73,83,91,96] The studies in which no association was found between high alcohol consumption and increased blood pressure were, in general, smaller or subgroup analyses and may have lacked the power to detect an effect.[51,61,80,81,84,85,90–92,99–101] High levels of alcohol consumption were a strong predictor of the development of high blood pressure in both men and women in most of the cohort studies.[29–31,37–39,43,45–47]

The results of epidemiologic studies suggest that approximately 0% to 33% and 0% to 8% of high blood pressure in

men and women respectively is attributable to alcohol consumption.[51,61,73,77,78,80,87,98,99,102] Building on the meta-analysis of English and associates,[103] Single and colleagues[104] recently estimated age- and sex-specific etiologic fractions for hypertension attributable to alcohol consumption for Canadian men and women. They estimated that among men the etiologic fraction ranged from 4% (for those aged 60–64 years) to 9.2% (for those aged 20–24 years), whereas among women it ranged from 0.6% (for those aged 80–84 years) to 2.6% (for those aged 20–24 years). Although these studies do not prove cause and effect, the extent to which alcohol is associated with high blood pressure in a population is likely related in part to the quantity of alcohol consumed.

To facilitate both therapeutic and preventive interventions, we recommend that the alcohol consumption of all patients be assessed. This can be accomplished only by careful history-taking. The quantity, frequency and other characteristics of the use of wine, beer and distilled spirits should be ascertained. Standardized screening instruments are useful in assessing the likelihood of hazardous or problem drinking.[105]

Recommendation

- It is recommended that health care professionals determine the alcohol consumption of their patients (grade D recommendation).

Alcohol consumption by normotensive adults

Table 1 summarizes the randomized controlled trials examining the effect of a reduction in alcohol consumption on blood pressure in normotensive subjects. Reduction in alcohol consumption was consistently associated with a statistically significant reduction in blood pressure (level II evidence).

Recommendation

- To reduce blood pressure in the population at large and in particular in patients at risk for hypertension, it is recommended that alcohol consumption be in accordance with Canadian low-risk drinking guidelines (i.e., healthy adults who choose to drink should limit alcohol consumption to 2 or fewer standard drinks per day, with consumption not exceeding 14 standard drinks per week for men and 9 standard drinks per week for women) (grade B recommendation).

Alcohol consumption by adults with hypertension

Table 2 shows the effect of reducing alcohol consumption in patients with hypertension who had been drinking moderately large quantities of alcohol. Although all of the studies reported a reduction in both systolic and diastolic blood pressure in association with reduced alcohol consumption, this change was not statistically significant in 7 of the 14 comparisons.

Several reasons may account for these conflicting results. In many of the randomized controlled trials,[107–111] there were substantial reductions in alcohol consumption by *both* the control and the intervention groups, which raises the possibility that

Table 1: Randomized controlled trials examining the effect of alcohol consumption on blood pressure in normotensive people

				Estimated alcohol consumption, standard drinks/wk*		Change in blood pressure, sitting or supine, mm Hg	
Study design	Subjects	Intervention	Duration	Mean baseline	Reduction	SBP	DBP
Crossover[15]	45 men; normotensive	Low-alcohol beer	6 wk	20	16	–3.8, $p = 0.006$	–1.4, $p = 0.044$
2 × 2 factorial[16]	86 men; overweight	Low-alcohol beer; weight loss	18 wk	26	22	–4.8,† $p < 0.01$	–3.3,† $p < 0.01$
2 × 2 factorial[17]	72 men; sedentary	Exercise; low-alcohol beer	4 wk	28	25	–4.7,† $p < 0.01$	–1.9,† $p < 0.05$
Crossover[18]	8 men; normotensive	Alcohol v. no alcohol	4 d	34	34	–6.0, $p < 0.005$	–8.0, $p < 0.001$
Crossover[19]	10 men; normotensive	Alcohol v. no alcohol	7 d	28‡	28‡	–3.0, $p < 0.05$	–3.1, $p < 0.01$
Parallel[20]	641 men, 268 women; moderate to heavy drinkers§	Standardized advice, education	12 mo	Men 42, women 24	Men 6.7, women 3.5	Men –2.1, $p < 0.05$; women NP	NP
Crossover[21]	5 men, 5 women; normotensive	Alcohol v. no alcohol	4 d	> 21	41	–8, $p < 0.025$	–6, $p < 0.001$

Note: SBP = systolic blood pressure, DBP = diastolic blood pressure, NP = data not provided.
*One standard drink contains 13.6 g of ethanol. This is approximately the amount of ethanol in 1.5 fluid ounces of spirits (40%), 12 fluid ounces of beer (5%) or 5 fluid ounces of wine (12%). The accuracy of estimates of alcohol consumption are limited by study methodology, design and reporting of results. Reduction in consumption is relative to control group.
† Effects of alcohol alone.
‡ Alcohol was administered on a weight basis; we assumed the average weight was 70 kg.
§The study population included people with hypertension.

the consent process or another aspect of entry into the clinical trial led to a reduction in alcohol consumption. This appears to have been the major factor in the lack of difference in blood pressure reduction for the largest randomized controlled study examining this issue.[106] Some people have difficulty reducing alcohol consumption, so some hypertensive patients in the studies may not have adhered to the alcohol reduction protocol, even though they reported a reduction in alcohol consumption when questioned directly. This phenomenon could account for the lack of effectiveness of alcohol restriction in some studies.

We also examined evidence from uncontrolled clinical interventions, community-based programs, and case–control and twin studies[34,112–119] (level III evidence), along with the data from the cross-sectional and cohort studies previously cited. Most of these studies showed a strong association between heavy alcohol consumption and high blood pressure and provided evidence consistent with the conclusion that a reduction in alcohol consumption may lead to a reduction in blood pressure.

Recommendation

- For hypertensive patients, it is recommended that alcohol consumption be in accordance with Canadian low-risk drinking guidelines (i.e., healthy adults who choose to drink should limit alcohol consumption to 2 or fewer standard drinks per day, with consumption not exceeding 14 standard drinks per week in men and 9 standard drinks per week in women) (grade C recommendation).

Multiple-intervention studies

A reduction in alcohol consumption was attempted in 3 randomized controlled trials[120–122] that simultaneously examined several lifestyle interventions to reduce blood pressure or prevent hypertension. In two of these studies[120,121] there were similar reductions in alcohol consumption in the intervention and control groups (i.e., no significant effect of the intervention on alcohol consumption), and there was no association between change in alcohol consumption and change in blood pressure. In the third study[122] the intervention resulted in a reduction in alcohol intake, and there was an association between reduction in alcohol intake and reduction in systolic blood pressure. These studies do not provide strong evidence but are consistent with the conclusion that heavy alcohol consumption leads to increased blood pressure.

Interpretation

The results of randomized controlled trials involving normotensive adults indicate a causal association between alcohol consumption above recommended levels and increases in blood pressure. Prospective cohort studies have shown a strong association between heavy alcohol consumption and the development of hypertension in men and women. The association between blood pressure and alcohol consumption of fewer than 2 standard drinks per day is not clear, as observational studies have variously found increases, decreases and no change in blood pressure.

Table 2: Randomized controlled trials examining the effect of alcohol consumption on blood pressure in hypertensive patients

				Estimated alcohol consumption, standard drinks/wk		Change in blood pressure, sitting or supine, mm Hg	
Study design	Subjects	Intervention	Duration	Mean baseline	Reduction	SBP	DBP
Parallel[22,106]	375 normotensive; 266 hypertensive	Alcohol reduction; cognitive behaviour program	2 yr	32	8.4	–0.9, NS	0.6, NS
2 × 2 factorial[23]	59 hypertensive men	Low-alcohol beer; low salt	4 wk	32	28	–5.4,* $p < 0.01$	–3.2*, $p < 0.01$
Parallel[24]	41 hypertensive men	Advice to decrease alcohol intake	8 wk	44	22	NS, NP	NS, NP
Crossover[25]	44 hypertensive men	Low-alcohol beer	6 wk	26	23	–5, $p < 0.001$	–3, $p < 0.001$
Crossover[26]	54 hypertensive men	Advice to maintain or decrease alcohol consumption	3 wk	23	12	–3.6, $p < 0.05$	–1.9, NS
Parallel[27]	49 hypertensive men	Advice to abstain from or reduce alcohol consumption	2 wk	30	19	–5.2, $p = 0.005$	–2.1, NS
Parallel[28]	123 men, 6 women; all hypertensive	Training of physician	1 yr	49	8	–7.3, $p < 0.01$	–0.7, NS

Note: NS = nonsignificant.
*Effects of alcohol alone.

Randomized controlled trials of reduction in alcohol intake indicate that this is an efficacious means of reducing blood pressure in normotensive people. The intervention data for patients with hypertension, while inconclusive, are consistent with such an effect. We deliberately chose to present data on blood pressure determined in the sitting or supine position after 5 minutes rest (or the closest approximation to this interval) to be consistent with current recommendations on how blood pressure should be determined. In some of the original studies,[23–28,106] more dramatic reductions in blood pressure were reported because the method of determining blood pressure was not consistent with these recommendations.

Our recommendations concerning alcohol use and the prevention and treatment of hypertension are based on a number of considerations. First, it cannot be established whether the blood pressure of people who consume alcohol at low levels is lower or higher than that of nondrinkers. Current Canadian low-risk drinking guidelines take into account a wide range of outcomes associated with alcohol use, balancing both risks and benefits. For most consequences (e.g., diseases of the liver, pancreas and nervous system, hemorrhagic stroke, and various cancers) risk increases with alcohol consumption.[107] For accidents and injuries, as well as for adverse effects on social well being, lower consumption is associated with lower risk. Conversely, for ischemic heart disease, alcohol appears to be protective over a wide range of consumption levels, from less than 4 drinks per week to 5 or 6 drinks per day, at least in older people.[35,69,75,123–133] However, within this range, ischemic heart disease does not appear to diminish with increased intake, and most of the protective effect is associated with drinking very small amounts of alcohol. The association between alcohol consumption and ischemic stroke is less clear.[134] The lowest risks of overall illness and death are associated with alcohol consumption within the limits recommended in the Canadian guidelines on low-risk drinking.[35,44,69,70,118,129–131,135–143]

It is widely recognized that some people should not use alcohol at all (e.g., those with a personal or family history of serious drinking problems, those with liver disease and those receiving medications that interact with alcohol). However, with regard to the prevention and treatment of hypertension, there were insufficient data to support a general recommendation about abstinence. Similarly, a general recommendation that hypertensive or normotensive people who currently abstain from drinking alcohol should begin consuming small amounts of alcohol to protect against ischemic heart disease and stroke was not supported by the panel. The panel agreed that a careful assessment of the patient's characteristics and his or her risk factors and circumstances by the health care provider was appropriate as a basis for individual advice.

Validation

These recommendations are consistent with those of the World Hypertension League,[14] the National High Blood Pressure Education Program Working Group on Primary Prevention of Hypertension[3] and previous recommendations of the Canadian Coalition for High Blood Pressure Prevention and Control[4,12] and the Canadian Hypertension Society.[4] The low-risk drinking guidelines are those jointly recommended by the Addiction Research Foundation of Ontario and the Canadian Centre on Substance Abuse in a 1997 policy statement[9] and endorsed by the Canadian College of Family Physicians and other agencies, including provincial associations. These guidelines build on an earlier set of guidelines produced by the same 2 organizations, which were endorsed by the Canadian Medical Association, the Royal College of Physicians and Surgeons of Canada and the Canadian Medical Society on Alcohol and Other Drugs.[144]

Future research

More research on the association between alcohol consumption and blood pressure is needed. Many of the randomized controlled trials we reviewed included few women; future research must be designed to ensure adequate representation of both sexes. Several studies have suggested that the pattern of drinking, for example continuous or binge drinking[48,74,93,100] and infrequent or frequent low-level consumption, may be important.[95] Future studies should closely examine the effect of timing of blood pressure determination in relation to most recent alcohol consumption and would benefit from the inclusion of ambulatory blood pressure monitoring over several days.

Further studies examining the additive effects of several lifestyle interventions, including reduction in alcohol consumption, are needed. In addition, studies should include measurements of the side effects of the interventions.

More care is required in study design to address the possibility of similar reductions in alcohol consumption in both the intervention and the control groups. The possibility of reporting bias indicates a need for objective measures of alcohol consumption (e.g., levels of γ-glutamyltransferase).

Finally, research into the public health impact in Canada of hypertension attributable to alcohol consumption, including the economic costs, should be a priority. The recent study by Single and colleagues[104] provides a prototype for such research.

Conclusion

Assessment of alcohol intake should be an important part of routine medical assessments.

For those who consume large quantities of alcohol, a reduction in consumption will reduce blood pressure and have other beneficial health effects. Adherence to low-risk drinking guidelines is an important nonpharmacologic manoeuvre to prevent and control hypertension.

We are grateful for the external reviews of Drs. Eric Single, Gre-

gory Taylor, Elinor Wilson and Nady el-Guebaly, as well as those of the Canadian Council of Cardiovascular Nurses, the Canadian Nurses Association, the Canadian Pharmacists Association, the Canadian Public Health Association, the College of Family Physicians of Canada, the Heart and Stroke Foundation of Canada, Hoechst Marion Roussel and Merck Frosst Canada Inc.

The financial assistance of the Laboratory Centre for Disease Control at Health Canada and Astra Pharma Inc., Bayer Inc., Bristol-Meyers Squibb Pharmaceutical Group, Knoll Pharma Inc., Merck Frosst Canada Inc., Searle Canada Inc. and Servier Canada Inc. is gratefully acknowledged, as is the secretarial assistance of Leslie Holmes.

Competing interests: None declared for Drs. Ashley, Carruthers and McKay. Dr. Campbell receives educational grants, speaker's fees, travel assistance and consultancy fees from various pharmaceutical companies. Dr. Lacourcière receives consultancy fees from a pharmaceutical company for work related to antihypertensive medication.

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