ISSN: 2474-3690

Bruno et al. J Hypertens Manag 2018, 4:030
DOI: 10.23937/2474-3690/1510030
Volume 4 | Issue 1
Open Access

Journal of
Hypertension and Management

REVIEW ARTICLE

Lifestyle and Hypertension: An Evidence-Based Review

Cosimo Marcello Bruno[1*], Maria Domenica Amaradio[1], Gabriele Pricoco[1], Elisa Marino[1] and Francesca Bruno[2]

[1]Department of Clinical and Experimental Medicine, Section of Internal and Emergency Medicine, School of Medicine, University of Catania, Catania, Italy

[2]Department of Clinical and Experimental Medicine, Section of Nephrology, School of Medicine, University of Catania, Catania, Italy

***Corresponding author:** *Prof. Cosimo Marcello Bruno, Department of Clinical and Experimental Medicine, Section of Internal and Emergency Medicine, School of Medicine, G. Rodolico University Hospital, University of Catania, via S. Sofia - 95126, Catania, Italy, Tel: 0039-0953781563, E-mail: cmbruno@unict.it*

Abstract

Emerging data suggest that lifestyle habits may affect blood pressure values. In this review, authors examine the more relevant clinical and epidemiological studies about the influence that multiple lifestyle factors play on development of hypertension. They conclude that there is clear evidence that lifestyle changes can have a favorable effect on prevention and treatment of hypertension, with emphasis on alcohol and sodium intake, smoking cessation, physical activity level and dietary pattern. Physicians and Public Health Authorities should encourage positive lifestyle modifications.

Keywords

Lifestyle, Hypertension, Salt intake, Physical activity, Dietary pattern

Introduction

Cardiovascular disease (CVD) is the most common cause of death in industrialized countries and blood hypertension is the most frequent treatable risk factor for development of cardiovascular diseases (CVD) [1].

In fact, hypertension is closely associated to a major incidence of stroke (ischaemic and haemorrhagic), myocardial infarction, heart failure, chronic kidney disease, peripheral vascular disease, cognitive decline and premature death [2].

The prevalence of hypertension increases in the older age subjects and modest heterogeneity was observed among various European countries. At the standard threshold (i.e. blood pressure 140/90 mmHg or treatment with antihypertensive medication) about 30-40% of overall adult European population resulted affected by hypertension [3].

Though several antihypertensive drugs are today available and clinical trials have demonstrated a reduction of cardiovascular complications and mortality rate consequent to lowering of blood pressure [4-9], only a third of treated hypertensive patients achieves the target values.

Clinical and observational studies also showed that individual lifestyle factors are associated to cardiovascular morbidity and mortality [10,11]. Emerging data suggest that lifestyle changes are useful and effective to reduce blood pressure and global cardiovascular risk.

Moreover, the more recent guidelines for the management of arterial hypertension [12] recommend to institute lifestyle measures, whenever appropriate, in all hypertensive patients, including those who require drug treatment. The non-adoption of appropriate lifestyle in hypertensive subjects can thwart therapeutic effect of drugs and prevent achievement of target values.

In this brief review, we examined the reports, derived from experimental, prospective cohort studies and outcome trials recorded in the main biomedical databases (PubMed, Scopus) and regarding the impact of lifestyle measures on blood pressure and CVD.

Citation: Bruno CM, Amaradio MD, Pricoco G, Marino E, Bruno F (2018) Lifestyle and Hypertension: An Evidence-Based Review. J Hypertens Manag 4:030. doi.org/10.23937/2474-3690/1510030

Received: September 06, 2017: **Accepted:** February 27, 2018: **Published:** March 01, 2018

Alcohol Intake

It is well known the deleterious effect of alcohol abuse on liver, heart, pancreas, blood pressure and other organ systems. The acute effects of alcohol intake on blood pressure are complex and nonlinear, with both pressor and depressor effects depending on time since administration [13]. Heavy consumption of alcohol has long been associated with increased blood pressure [14] and a linear relationship between alcohol consumption, blood pressure levels and the prevalence of hypertension in population has been reported [15-17]. Fuchs, et al. [18] showed that increase of blood pressure produced by alcohol abuse regards particularly systolic values and it is more evident in black man, independently from type of drink, whether red wine, white wine, beer or liquor.

On the other hand, the role of moderate alcohol intake is still debated.

Sesso, et al. [19] in a prospective study found a J-shaped association between alcohol intake and hypertension in women and a positive and significant relation with hypertension in men. Authors concluded that light-to-moderate alcohol consumption decreased hypertension risk in women and increased risk in men. Similar results were reported by Briasoulis, et al. [20] in a more recent meta-analysis, while the unfavorable role of heavy alcohol consumption both in women and men was confirmed.

Rimm, et al. [21] in a meta-analysis, based on 42 papers published from 1965 to 1988, reported that a moderate alcohol intake (< 30 g/day) is causally related to lower risk of coronary heart disease through changes in lipids and haemostatic factors. The results of this paper were contradictory with results of another meta-analysis [22] and have been criticized on the basis of methodological flaws in the selection of patients.

However, two more recent meta-analyses [23,24], based on strength evidences, confirmed favorable changes in cardiovascular risk associated to moderate alcohol consumption.

Brien, et al. [23] in a systematic review and meta-analysis of interventional studies found that light alcohol intake (< 15 g/day for women and < 30 g/day for men) had favorable effects on levels of several cardiovascular biomarkers (HDL-cholesterol, apolipoprotein A1, adiponectin, and fibrinogen).

Another comprehensive review [25] assessed the effect of alcohol consumption on multiple cardiovascular outcomes. Light to moderate alcohol consumption was associated to reduced incident coronary disease, lower risk of mortality from cardiovascular disease and from all causes. These results provide indirect pathophysiological support for a protective effect of moderate alcohol use on global cardiovascular risk.

In addition, it has been reported that moderate alcohol consumption improves insulin sensitivity [26,27] and is associated to lower risk to develop type 2 diabetes compared with abstaining and heavier drinking [28].

The underlying mechanisms for these beneficial effects on glucose metabolism are not entirely clear but a great part of them appears to be attributable to the changes in adiponectin levels. However, the favorable effects of alcohol on lipid metabolism [21] as well as action of acetate, the end product of ethanol oxidation [29], able to reduce lipolysis and fat oxidation [30] could contribute to indirectly improve insulin resistance and glucose metabolism, explaining the association between light alcohol consumption and type 2 diabetes.

Furthermore, it has also been reported that moderate alcohol intake is associated with lower levels of markers of inflammation and endothelial dysfunction [31,32] suggesting a protective multi-role of light alcohol intake in development of cardiovascular disease.

Nevertheless, the favorable effects on HDL and LDL cholesterol values were counterbalanced by unfavorable action on blood pressure and triglyceride levels [29].

Cumulatively, these studies suggest that the beneficial effect of light alcohol intake should not be emphasized because action of alcohol also depends upon gender and racial differences and cardiometabolic effects are complex and contradictory. In addition, the habitual consumption of alcohol can induce, even unknowingly, a progressive increase of the introduced doses with shift from light to heavy intake.

Salt Intake

The relationship between the intake of sodium and extracellular fluid volume, arterial pressure and neuroendocrine systems is well known [33]. Experimental studies suggest that high sodium intake, independently from arterial pressure, determines increase of left ventricular mass and intima-media thickness of large arteries, severe proteinuria and renal fibrosis [34-38].

Interventional studies demonstrated that an increase in sodium intake produces an increase of circulating endothelin-1, a potent vasoconstrictor and proinflammatory peptide [39,40], while salt reduction determines improvements in artery flow-mediated dilation [41,42].

Then, many of the renal and cardiovascular damages observed in salt-sensitive hypertensive patients could be also due to intrinsic effect of sodium on microvascular vasomotion.

With regard to the role of dietary salt intake on development and treatment of hypertension, several prospective and outcome trials demonstrated that a lower salt intake is related to a reduced risk of CVD.

Among others, two large cohort studies, the Inter-

national Study of Salt and Blood Pressure (INTERSALT) [43] and the Dietary Approach to Stop Hypertension trial (DASH) [44], showed a significant inverse relationship between salt intake and both systolic and diastolic blood pressure. In the INTERSALT study, an international multicentre trial, multivariate analysis demonstrated that a sodium intake higher by 100 mmol/die resulted on average in a higher systolic and diastolic blood pressure of 3-6 mmHg in the overall investigated population.

The DASH study showed that, reducing salt intake, systolic and diastolic pressure lowered in a linear manner both in hypertensive and normotensive patients.

A meta-analysis of large prospective studies [45] revealed that higher salt intake is associated with significantly greater incidence of strokes and total cardiovascular events, with a dose dependent association. A difference of 5 g a day in habitual salt intake is associated with a 23% difference in the rate of stroke and 17% difference in the rate of total cardiovascular disease with evident social and economic benefits.

A computer-simulation study [46], based on state-transition model for CVD incidence in the U.S. population, revealed that reducing salt by 3 gm/day, new cases of stroke, myocardial infarction and death for all causes could be greatly reduced.

A more recent meta-analysis [47] confirmed that lowering sodium intake reduces blood pressure in adults and children and has no adverse effect on blood lipids, catecholamine levels or renal function.

Nevertheless, in the last years, the association between sodium intake and hypertension has been partially reconsidered.

A recent prospective large cohort study confirmed a significant positive relationship between dietary sodium, estimated by urinary sodium excretion, and blood pressure, but this relation was stronger among study participants with sodium excretion of more than 5 gr. for day and among subjects with hypertension than among those without hypertension [48].

Some studies also reported a U-shaped association between sodium consumption and cardiovascular disease and mortality, with increased risk both at low and high sodium intake [49,50].

These findings were confirmed by two meta-analyses [51,52], suggesting a significant heterogeneity in the association between daily sodium intake and cardiovascular outcome. Moreover, the effect of low dietary sodium in normotensive subjects is very little and negligible. Then, on basis of scientific evidences, appears reasonable and justified to reduce dietary sodium to less than 3-4 g/day in hypertensive patients and in those with heart and/or renal failure. Instead, no clear benefit is proved for reducing sodium intake in normotensive subjects and in the general population. Further prospective investigations are required to clarify this matter.

Cigarette's Smoking

It is completely accepted that cigarette smoking is a major cardiovascular risk factor for the heart and blood vessels because of the effects of some compounds, primarily nicotine and carbon monoxide [53,54]. Functional and structural alterations are often observed as a consequence of nicotine and carbon monoxide activity [55-58].

In animal and human models, several studies have demonstrated that both active and passive cigarette smoke exposure were associated with a decrease in vasodilatory function.

Cigarette smoke exposure impairs endothelium-dependent vasodilatation in macrovascular such as in microvascular beds [55,59-62]. Nitric-Oxide (NO) plays a pivotal role in the vasodilatory function of endothelium. It has been showed that smoke exposure decreases NO availability by altering the expression and activity of the endothelial NO synthase enzyme.

Moreover, nicotine and its isomers cause catecholamine release and sympathetic stimulation [63-65]. Sympathetic nervous system stimulation acutely determines increased heart rate and systolic blood pressure. These effects are transient but repeatable.

Thus, cigarette smoke has a double action on vascular resistances, acting by an impaired endothelium-dependent vasodilatation and an increased catecholamine-dependent vasoconstriction. In addition, the evidence indicates that smoking produces increased aggregation and adhesiveness of platelets, leading to blood rheology changes with enhanced viscosity and higher risk of thrombosis [66-68].

With regard to the association of cigarette smoking with hypertension, results from epidemiological and interventional studies are unclear and contradictory.

Some studies [69-72] reported an increased blood pressure and development of hypertension in cigarette smokers compared to non-smokers, suggesting an unfavorable action of smoking on pressure values related to long-term exposure and to number of smoked daily cigarettes.

Recently, a significant improvement in systolic and diastolic pressure in subjects who quit or reduced their tobacco consumption has been reported [73].

Others studies [74-76], however, reported that smoker status does not directly affect development of hypertension or blood pressure value. Observational analyses found that current smoking is associated with lower blood pressure and lower prevalence of hypertension and did not support a causal association between smoking and blood pressure [77].

Regardless of tobacco's effect on blood pressure, cigarette smoking is considered an independent major

risk factor for development of cardiovascular complications such as stroke, myocardial infarction, renal failure and congestive heart failure. The association of smoking and hypertension increases the cardiovascular risk in an exponential manner. Then, cigarette smoking cessation is strongly recommended in all the people, especially those affected by hypertension, diabetes mellitus, coronary heart disease or other risk factors.

Physical Activity

It has been reported that exercise training plays several hemodynamic and metabolic beneficial effects, reducing global cardiometabolic risk.

It reduces sympathetic responses and affects the hypothalamic-pituitary-adrenal axis with lower cortisol increase, lower cardiovascular reactivity and more rapid cardiovascular recovery in response to psychophysical stress [78-80].

Moreover, physical activity determines a systemic adaptation of the arterial wall which might lead to decrease in peripheral resistance [81]. Exercise training leads to a higher number of capillaries for muscle fiber by increasing a number of pro-angiogenic factors [82,83]. An increasing number of reports [84-88] suggests that physical activity is also able to ameliorate vascular function by reducing arterial stiffness and improving the balance between vasoconstrictor and vasodilator systems.

However, to assess the role of physical activity on blood pressure can be really hard because many confounding factors such as age, magnitude and duration of exercise, muscles involved and comorbidities can lead to mismatch of results.

Must of studies [89-93] reported a significant reduction of blood pressure after an exercise session but results are difficult to compare because they were obtained with different methodologies, depending by the characteristics of the sample (i.e. hypertensive or normotensive subjects), use of antihypertensive medication, training status, whether the exercise is performed intermittently or continuously, the time of day when it is performed and characteristics of measurement performed (whether blood pressure was measured at rest or by ambulatory monitoring).

Although this variability, several meta-analyses and epidemiological evidences have consistently shown a total beneficial effect of a regular physical activity [94-96]. A regularly performed aerobic exercise of mild to moderate intensity is effective in lowering blood pressure in hypertensive individuals for all ages and both genders. The average exercise-related decrease in blood pressure is about 7-10 mmHg for systolic and 4-8 mmHg for diastolic blood pressure.

The reduction of pressure values obtained after onset of regular exercise training could lead in some cases to reduce or to stop the use of antihypertensive drugs [97].

It has also been reported [98-100] that a habitual physical activity is able to prevent the development of hypertension, while sedentary normotensive individuals have a relative risk approximately 35% to 70% higher to develop hypertension when compared to their physically active peers.

In addition, a regular aerobic exercise training shown to be useful to ameliorate lipid profile, glycemic control and overweight, reducing the global cardiovascular risk and mortality [101,102]. For these reasons, a moderate-intensity dynamic aerobic exercise during at least 30 minutes on 5-7 days per week is strongly recommended by current European and American guidelines [103,104].

Dietary Patterns

The effects of modifying whole dietary patterns on blood pressure have been extensively investigated. In addition to reducing alcohol and salt intake, as noted above, a variety of evidence suggest that the adoption of an adequate diet plays a role in lowering blood pressure value. Caloric intake is related to body weight but obesity and overweight are associated to hypertension. Trials have documented that weight loss lowers blood pressure, independently from achievement of desirable body weight [105-107]. In a meta-analysis of 25 trials, an average weight loss of 5.1 kg was associated to reduction in mean 4.4 mmHg systolic and 3.6 mmHg diastolic pressure [108].

It has been also reported that modest weight loss can prevent hypertension in prehypertensive individuals and can facilitate medication step down and drug withdrawal [109-111]. It has been documented that increased potassium intake lowers blood pressure both in non-hypertensive and hypertensive subjects [112-114]. This hemodynamic effect of potassium appears to be more pronounced in individuals with high sodium intake and may be linked to potassium-mediated sodium excretion in the renal distal tubule [113].

Epidemiological evidence suggests that a low dietary intake of calcium and magnesium can increase prevalence of hypertension [115,116]. However, the available data are not exhaustive and a generalized supplementation of calcium and magnesium is not currently recommended in hypertensive patients [117,118].

Moreover, several clinical trials [119-121] have demonstrated that comprehensive dietary changes can play an important role in the etiology, prevention and treatment of hypertension. In particular, a diet rich of fruits, vegetables, fiber and fish oil is effective in reducing blood pressure and its related cardiovascular complications and mortality.

Omega-3 polyunsaturated fatty acids, mainly con-

tained in fish, have demonstrated a benefit for cardiovascular disease risk reduction, supporting higher amounts of fish intake [122]. It has also been reported [123] that omega-3 supplementation improves arterial stiffness and endothelial function. These effects of omega-3 fatty acid are likely due to its ability to incorporate into phospholipid membranes, by partially replacing arachidonic acid as an initial substrate to produce anti-inflammatory eicosanoids. Moreover, some studies [124-126] showed a light but significant decrease of blood pressure values in patients treated with omega-3 supplements. Recently, a meta-analysis, including 8 studies with more than 56,000 participants, showed that normotensive subjects with the highest dietary consumption of omega-3 had a 27% lower risk of developing hypertension than subjects with the lowest intake [127].

Olive oil consumption has been associated to increased antioxidant properties. Extra virgin olive oil contains phenolic compounds, hydroxytyrosol and oleuropein which are potent antioxidant, free radical scavengers and enzyme modulators [128]. Other studies [129-132] showed that olive oil reduces oxidative stress and systemic inflammation and improves endothelial repair. A consistent number of observational data also showed the beneficial effects of a diet rich in fruit and vegetables on blood pressure and on the cardiovascular risk profile.

These benefits of fruit and vegetables could be due to the combined effect of reduced total caloric burden, antioxidant properties, increased flavonol and vitamins intake and nitric oxide synthesis.

Mediterranean diet has all these beneficial properties because it is based on high consumption of olive oil, legumes, cereals, fruits, vegetables, fish and low consumption of meat and meat products [133].

This diet is low in saturated fats and guarantees an adequate intake of vitamins, minerals and beneficial non-nutrient substances such as polyphenols and anthocyanins.

Several epidemiological studies [134-136] have confirmed the effectiveness of this dietary pattern. Then, there is ample evidence that dietary change with reduced caloric intake, whether appropriate, increased consumption of fish, fruits and vegetables and reduced intake of saturated fatty acids offers an additional nutritional approach to the prevention and treatment of hypertension.

Conclusions

Hypertension has been recognized as a major risk factor for development of several cardiovascular diseases. On basis of literature data today available, there is clear evidence that lifestyle habits may influence blood pressure value. Then, lifestyle changes can provide beneficial effects in hypertensive patients, reducing global cardiovascular risk and all-cause mortality.

Table 1: Adverse pathophysiological effects of a wrong lifestyle.

Heavy alcohol intake	Liver, pancreas and cardiovascular damage
High salt intake	Increased circulating volume
	Increased left ventricular mass
	Raised intima-media thickness
	Elevated plasma endothelin-1
	Reduced flow-mediated dilation
Cigarette smoke	Impaired vasodilatory function
	Reduced endothelium-dependent vasodilatation
	Reduced nitric oxide availability
	Excessive sympathetic stimulation
	Increased platelet aggregation
Reduced physical activity	Altered cardiovascular reactivity
	Increased arterial stiffness
	Impaired vasoconstrictor-vasodilator balance
Wrong diet	Overweight and obesity
	Reduced antioxidant and anti-inflammatory properties
	Reduced nitric oxide synthesis
	Inadequate vitamin and mineral intake

According to scientific evidence, reduction of alcohol and salt intake, smoking cessation, execution of a regular aerobic physical activity, correction of overweight with adoption of a balanced norm-caloric diet, rich of fresh fruits and verdures and low in saturated fats, are the main lifestyle changes that determine the best results for prevention and treatment of hypertension.

In Table 1, the main pathophysiological alteration associated to a wrong lifestyle are summarized. Positive lifestyle modifications can sometimes involve the reduction or interruption of antihypertensive drugs, reducing the economic impact and avoiding the side effects of the pharmacological treatment.

On the other hand, the lack of these lifestyle measures can prevent the achievement of pressure target in patients undergoing antihypertensive drugs.

For these reasons, we believe that lifestyle changes should precede or accompany the onset of pharmacological treatment.

Physicians should not prescribe drugs without clearly informing patients in detail about the benefits that a desirable lifestyle can bring to their health and provide psychological and motivational support.

Public Health Authorities, by appropriate information campaigns, should promote and encourage the adoption of a correct lifestyle model not only in hypertensive individuals but in the general population.

Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

1. Keys A (1980) Seven countries: A multivariate analysis of death and coronary heart disease. Harvard University Press, Cambridge, MA.
2. Anderson KM, Odell PM, Wilson PWF, Kannel WB (1991) Cardiovascular disease risk profiles. Am Heart J 121: 293-298.
3. Wolf-Maier K, Cooper RS, Banegas JR, Giampaoli S, Hense HW, et al. (2003) Hypertension prevalence and blood pressure levels in 6 European countries, Canada, and the United States. JAMA 289: 2363-2369.
4. (1985) MRC trial of treatment of mild hypertension: Principal results. Medical Research Council Working Party. Br Med J (Clin Res Ed) 291: 97-104.
5. (1991) Prevention of stroke by antihypertensive drug treatment in older persons with isolated systolic hypertension: Final results of the Systolic Hypertension in the Elderly Program (SHEP). SHEP Cooperative Research Group. JAMA 265: 3255-3264.
6. Dahlof B, Lindholm LH, Hansson L, Schersten B, Ekbom T, et al. (1991) Morbidity and mortality in the Swedish Trial in Old Patients with Hypertension (STOP-Hypertension). Lancet 338: 1281-1285.
7. PROGRESS Collaborative Group (2001) Randomised trial of perindopril based blood pressure-lowering regimen among 6105 individuals with previous stroke or transient ischaemic attack. Lancet 358: 1033-1041.
8. Staessen JA, Fagard R, Thijs L, Celis H, Arabidze GG, et al. (1997) Randomised double-blind comparison of placebo and active treatment for older patients with isolated systolic hypertension. The Systolic Hypertension in Europe (Syst-Eur) Trial Investigators. Lancet 350: 757-764.
9. Turnbull F, Neal B, Algert C, Chalmers J, Chapman N, et al. (2005) Effects of different blood pressure-lowering regimens on major cardiovascular events in individuals with and without diabetes mellitus: Results of prospectively designed overviews of randomized trials. Arch Intern Med 165: 1410-1419.
10. Chiuve SE, McCullough ML, Sacks FM, Rimm EB (2006) Healthy lifestyle factors in the primary prevention of coronary heart disease among men: Benefits among users and nonusers of lipid-lowering and antihypertensive medications. Circulation 114: 160-167.
11. Knoops KT, de Groot LC, Kromhout D, Perrin AE, Moreiras-Varela O, et al. (2004) Mediterranean diet, lifestyle factors, and 10-year mortality in elderly European men and women: The HALE project. JAMA 292: 1433-1439.
12. Whelton PK, Carey RM, Aronow WS, Casey DE, Collins KJ, et al. (2017) 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation and management of high blood pressure in adults. J Am Coll Cardiol.
13. Abe H, Kawano Y, Kojima S, Ashida T, Kuramochi M, et al. (1994) Biphasic effects of repeated alcohol intake on 24-hour blood pressure in hypertensive patients. Circulation 89: 2626-2633.
14. Klatsky AL (2003) Alcohol and cardiovascular disease-more than one paradox to consider. Alcohol and hypertension: Does it matter? Yes. J Cardiovasc Risk 10: 21-24.
15. Puddey IB, Beilin LJ, Rakie V (1997) Alcohol, hypertension and the cardiovascular system: A critical appraisal. Addict Biol 2: 159-170.
16. Puddey IB, Beilin LJ (2006) Alcohol is bad for blood pressure. Clin Exp Pharmacol Physiol 33: 847-852.
17. Okubo Y, Suwazono Y, Kobayashi E, Nogawa K (2001) Alcohol consumption and blood pressure change: 5-year follow-up study of the association in normotensive workers. J Hum Hypertens 15: 367-372.
18. Fuchs FD, Chambless LE, Whelton PK, Javier Nieto F, Heiss G (2001) Alcohol consumption and the incidence of hypertension: The Atherosclerosis Risk in Communities Study. Hypertension 37: 1242-1250.
19. Sesso HD, Cook NR, Buring JE, Manson JE, Graziano JM (2008) Alcohol consumption and the risk of hypertension in women and men. Hypertension 51: 1080-1087.
20. Briasoulis A, Agarwal V, Messerli FH (2012) Alcohol consumption and the risk of hypertension in men and women: A systematic review and meta-analysis. J Clin Hypertens (Greenwich) 14: 792-798.
21. Rimm EB, Williams P, Fosher K, Criqui M, Stampfer MJ (1999) Moderate alcohol intake and lower risk of coronary heart disease: Metaanalysis of effects on lipids and haemostatic factors. BMJ 319: 1523-1528.
22. Fillmore KM, Kerr WC, Stockwell T, Chikritzhs T, Bostrom A (2006) Moderate alcohol use and reduced mortality risk: Systematic error in prospective studies. Addiction Research & Theory 14: 101-132.
23. Brien SE, Ronksley PE, Turner BJ, Mukamal KJ, Ghali WA (2011) Effect of alcohol consumption on biological markers associated with risk of coronary heart disease: Systematic review and meta-analysis of interventional studies. BMJ 342: 636.
24. Ronksley PE, Brien SE, Turner BJ, Mukamal KJ, Ghali WA (2011) Association of alcohol consumption with selected cardiovascular disease outcomes: A systematic review and meta-analysis. BMJ 342: 671.
25. Davies MJ, Baer DJ, Judd JT, Brown ED, Campbell WS, et al. (2002) Effects of moderate alcohol intake on fasting insulin and glucose concentrations and insulin sensitivity in postmenopausal women: A randomized controlled trial. JAMA 287: 2559-2562.
26. Bell RA, Mayer-Davis EJ, Martin MA, D'Agostino RB Jr, Haffner SM (2000) Associations between alcohol consumption and insulin sensitivity and cardiovascular disease risk factors: The Insulin Resistance and Atherosclerosis Study. Diabetes Care 23: 1630-1636.
27. Koppes LL, Dekker JM, Hendriks HF, Bouter LM, Heine RJ (2005) Moderate alcohol consumption lowers the risk of type 2 diabetes: A meta-analysis of prospective observational studies. Diabetes Care 28: 719-725.
28. Beulens JW, Rimm EB, Hendriks HF, Hu FB, Manson JE, et al. (2007) Alcohol consumption and type 2 diabetes: Influence of genetic variation in alcohol dehydrogenase. Diabetes 56: 2388-2394.
29. Johnston CS, Kim CM, Buller AJ (2004) Vinegar improves insulin sensitivity to a high carbohydrate meal in subjects with insulinresistance or type 2 diabetes. Diabetes Care 27: 281-282.
30. Imhof A, Froehlich M, Brenner H, Boeing H, Pepys MB, et al. (2001) Effect of alcohol consumption on systemic markers of inflammation. Lancet 357: 763-767.
31. Sierksma A, van der Gaag MS, Kluft C, Hendriks HF (2002) Moderate alcohol consumption reduces plasma C-reactive protein and fibrinogen levels: A randomized, diet-controlled intervention study. Eur J Clin Nutr 56: 1130-1136.

32. Wakabayashi I (2018) Inverse association between excessive alcohol drinking and cardiometabolically healthy status in middle-aged men with and without overweight and obesity. Diabetes Metab Syndr 12: 31-37.

33. Graudal NA, Galløe AM, Garred P (1998) Effects of sodium restriction on blood pressure, renin, aldosterone, catecholamines, cholesterols, and triglyceride: A meta-analysis. JAMA 279: 1383-1391.

34. Yuan BX, Leenen FH (1991) Dietary sodium intake and left ventricular hypertrophy in normotensive rats. Am J Physiol 261: 1397-1401.

35. Kim S, Ohta K, Hamaguchi A, Yukimura T, Miura K, et al. (1995) Angiotensin II induces cardiac phenotypic modulation and remodeling in vivo in rats. Hypertension 25: 1252-1259.

36. Matavelli LC, Zhou X, Varagic J, Susic D, Frohlich ED (2007) Salt-loading produces severe renal hemodynamic dysfunction independent of arterial pressure in spontaneously hypertensive rats. Am J Physiol Heart Circ Physiol 292: 814-819.

37. Anh J, Varagic J, Slama M, Susic D, Frohlich ED (2004) Cardiac structural and functional responses to salt loading in SHR. Am J Physiol Heart Circ Physiol 284: 767-772.

38. Morgan T (2003) Renin, angiotensin, sodium and organ damage. Hypertens Res 26: 349-354.

39. Dickinson KM, Clifton PM, Keogh JB (2014) A reduction of 3 g/day from a usual 9 g/day salt diet improves endothelial function and decreases endothelin-1 in a randomised crossover study in normotensive overweight and obese subjects. Atherosclerosis 233: 32-38.

40. Gijsbers L, Dower JI, Schalkwijk CG, Kusters YH, Bakker SJ, et al. (2015) Effects of sodium and potassium supplementation on endothelial function: A fully controlled dietary intervention study. Br J Nutr 114: 1419-1426.

41. Jablonski KL, Racine ML, Geolfos CJ, Gates PE, Chonchol M, et al. (2013) Dietary sodium restriction reverses vascular endothelial dysfunction in middle-aged/older adults with moderately elevated systolic blood pressure. J Am Coll Cardiol 61: 335-343.

42. Dickinson KM, Keogh JB, Clifton PM (2009) Effects of a low salt diet on flow-mediated dilatation in humans. Am J Clin Nutr 89: 485-490.

43. (1988) Intersalt: An international study of electrolyte excretion and blood pressure. Results for 24 hour urinary sodium and potassium excretion. Intersalt Cooperative Research Group. BMJ 297: 319-328.

44. Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, et al. (2001) Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. N Engl J Med 344: 3-10.

45. Strazzullo P, D'Elia L, Kandala NB, Cappuccio FP (2009) Salt intake, stroke, and cardiovascular disease: Meta-analysis of prospective studies. BMJ 339: 4567.

46. Bibbins-Domingo K, Chertow GM, Coxson PG, Moran AE, Lightwood JM, et al. (2010) Reductions in Cardiovascular Disease Projected from Modest Reductions in Dietary Salt. N Engl J Med 362: 590-599.

47. He FJ, Li J, MacGregor GA (2013) Effect of longer term modest salt reduction on blood pressure: Cochrane systematic review and meta-analysis of randomised trials. BMJ 346: 1325.

48. Mente A, O'Donnell MJ, Rangarajan S, McQueen MJ, Poirier P, et al. (2014) Association of urinary sodium and potassium excretion with blood pressure. N Engl J Med 371: 601-611.

49. Stolarz-Skrzypek K, Kuznetsova T, Thijs L, Tikhonoff V, Seidlerova J, et al. (2011) Fatal and non-fatal outcomes, incidence of hypertension, and blood pressure changes in relation to urinary sodium excretion. JAMA 305: 1777-1785.

50. O'Donnell MJ, Yusuf S, Mente A, Gao P, Mann JF, et al. (2011) Urinary sodium and potassium excretion and risk of cardiovascular events. JAMA 306: 2229-2238.

51. Hooper L, Bartlett C, Davey Smith G, Ebrahim S (2004) Advice to reduce dietary salt for prevention of cardiovascular disease. Cochrane Database of Syst Rev.

52. Mente A, O'Donnell M, Rangarajan S, Dagenais G, Lear S, et al. (2016) Associations of urinary sodium excretion with cardiovascular events in individuals with and without hypertension: A pooled analysis of data from four studies. Lancet 388: 465-475.

53. Ezzati M, Henley SJ, Thun MJ, Lopez AD (2005) Role of smoking in global and regional cardiovascular mortality. Circulation 112: 489-497.

54. Neunteufl T, Heher S, Kostner K, Mitulovic G, Lehr S, et al. (2002) Contribution of nicotine to acute endothelial dysfunction in long-term smokers. J Am Coll Cardiol 39: 251-256.

55. Celermajer DS, Adams MR, Clarkson P, Robinson J, McCredie R, et al. (1996) Passive smoking and impaired endothelium-dependent arterial dilation in healthy young adults. N Engl J Med 334: 150-154.

56. Strong JP, Richards ML (1976) Cigarette smoking and atherosclerosis in autopsied men. Atherosclerosis 23: 451-476.

57. Castardeli E, Duarte DR, Minicucci MF, Azevedo PS, Matsubara BB, et al. (2008) Exposure time and ventricular remodeling induced by tobacco smoke exposure in rats. Med Sci Monit 14: 62-66.

58. Strachan DP (1991) Predictors of death from aortic aneurysm among middle-aged men: The Whitehall study. Br J Surg 78: 401-404.

59. Barua RS, Ambrose JA, Eales-Reynolds LJ, DeVoe MC, Zervas JG, et al. (2001) Dysfunctional endothelial nitric oxide biosynthesis in healthy smokers with impaired endothelium-dependent vasodilatation. Circulation 104: 1905-1910.

60. Barua RS, Ambrose JA, Srivastava S, DeVoe MC, Eales-Reynolds LJ (2003) Reactive oxygen species are involved in smoking-induced dysfunction of nitric oxide biosynthesis and upregulation of endothelial nitric oxide synthase: An in vitro demonstration in human coronary artery endothelial cells. Circulation 107: 2342-2347.

61. Ijzerman RG, Serne EH, van Weissenbruch MM, de Jongh RT, Stehouwer CD (2003) Cigarette smoking is associated with an acute impairment of microvascular function in humans. Clin Sci (Lond) 104: 247-252.

62. Giannini D, Leone A, Di Bisceglie D, Nuti M, Strata G, et al. (2007) The effects of acute passive smoke exposure on endothelium-dependent brachial artery dilation in healthy individuals. Angiology 58: 211-217.

63. Mizobe F, Livett BG (1983) Nicotine stimulates secretion of both catecholamines and acetylcholinesterase from cultured adrenal chromaffin cells. J Neurosci 3: 871-876.

64. Green WN, Wanamaker CP (1988) Formation of the acetylcholine receptor binding sites. J Neurosci 18: 5555-5564.

65. Glantz SA, Parmley WW (1991) Passive smoking and heart disease. Epidemiology, physiology, and biochemistry. Circulation 83: 1-12.

66. Hung J, Lam JY, Lacoste L, Letchacovski G (1995) Cigarette smoking acutely increases platelet thrombus formation in patients with coronary artery disease taking aspirin. Circulation 92: 2432-2436.

67. Hioki Y, Aoki K, Kawano K, Homori M, Hasumura Y, et al. (2001) Acute effects of cigarette smoking on platelet-dependent thrombin generation. Eur Heart J 22: 56-61.

68. Leone A, Landini L, Biadi O, Balbarini A (2008) Smoking and cardiovascular system: Cellular features of the damage. Curr Pharm Des 14: 1771-1777.

69. Hughes K, Leong WP, Sothy SP, Lun KC, Yeo PP (1993) Relationship between cigarette smoking, blood pressure and serum lipids in the Singapore general population. Int J Epidemiol 22: 637-643.

70. Mahmud A, Feely J (2003) Effects of passive smoking on blood pressure and aortic pressure waveform in healthy young adults-influence of gender. Br J Clin Pharmacol 57: 37-43.

71. Yarljoglues M, Kaya MG, Ardic I, Calapkorur B, Dogdu O, et al. (2010) Acute effects of passive smoking on blood pressure and heart rate in healthy females. Blood Press Monit 15: 251-256.

72. Bowman TS, Gaziano JM, Buring JE, Sesso HD (2007) A prospective study of cigarette smoking and risk of incident hypertension in women. J Am Coll Cardiol 50: 2085-2092.

73. Polosa R, Morjaria JB, Caponnetto P, Battaglia E, Russo C, et al. (2016) Blood pressure control in smokers with arterial hypertension who switched to electronic cigarettes. Int J Environ Res Public Health 13.

74. Gumus A, Kayhan S, Cinarka H, Sahin U (2013) The effect of cigarette smoking on blood pressure and hypertension. ABC Med 1: 8-15.

75. Li G, Wang H, Wang K, Wang W, Dong F, et al. (2017) The association between smoking and blood pressure in men: A cross-sectional study. BMC Public Health 17: 797.

76. Liu X, Byrd JB (2017) Cigarette smoking and subtypes of uncontrolled blood pressure among diagnosed hypertensive patients: Paradoxical associations and implications. Am J Hypertens 30: 602-609.

77. Linneberg A, Jacobsen RK, Skaaby T, Taylor AE, Fluharty ME, et al. (2015) Effect of smoking on blood pressure and resting heart rate: A mendelian randomisation meta-analysis in the CARTA consortium. Circ Cardiovasc Genet 8: 832-841.

78. Crews DJ, Landers DM (1987) A meta-analytic review of aerobic fitness and reactivity to psychosocial stressors. Med Sci Sports Exerc 19: S114-S120.

79. Rimmele U, Seiler R, Marti B, Wirtz PH, Ehlert U, et al. (2009) The level of physical activity affects adrenal and cardiovascular reactivity to psychosocial stress. Psychoneuroendocrinology 34: 190-198.

80. Jackson EM, Dishman RK (2006) Cardiorespiratory fitness and laboratory stress: A meta-regression analysis. Psychophysiology 43: 57-72.

81. Thijssen DH, Dawson EA, van den Munckhof IC, Birk GK, Timothy Cable N, et al. (2013) Local and systemic effects of leg cycling training on arterial wall thickness in healthy humans. Atherosclerosis 229: 282-286.

82. Hoier B, Hellsten Y (2014) Exercise-induced capillary growth in human skeletal muscle and the dynamics of VEGF. Microcirculation 21: 301-314.

83. Gliemann L, Buccs R, Nyberg M, Hoppeler H, Odriozola A, et al. (2015) Capillary growth, ultrastructure remodeling and exercise training in skeletal muscle of essential hypertensive patients. Acta Physiol (Oxf) 214: 210-220.

84. Beck, DT, Martin JS, Casey DP, Braith RW (2013) Exercise training reduces peripheral arterial stiffness and myocardial oxygen demand in young prehypertensive subjects. Am J Hypertens 26: 1093-1102.

85. Figueroa A, Park SY, Seo DY, Sanchez-Gonzalez MA, Baek YH (2011) Combined resistance and endurance exercise training improves arterial stiffness, blood pressure, and muscle strength in postmenopausal women. Menopause 18: 980-984.

86. Madden KM, Lockhart C, Cuff D, Potter TF, Meneilly GS (2009) Short-term aerobic exercise reduces arterial stiffness in older adults with type 2 diabetes, hypertension, and hypercholesterolemia. Diabetes Care 32: 1531-1535.

87. Nyberg M, Mortensen SP, Hellsten Y (2013) Physical activity opposes the age related increase in skeletal muscle and plasma endothelin-1 levels and normalizes plasma endothelin-1 levels in individuals with essential hypertension. Acta Physiol (Oxf) 207: 524-535.

88. Okada S, Hiuge A, Makino H, Nagumo A, Takaki H, et al. (2010) Effect of exercise intervention on endothelial function and incidence of cardiovascular disease in patients with type 2 diabetes. J Atheroscler Thromb 17: 828-833.

89. Cornelissen VA, Fagard RH (2005) Effects of endurance training on blood pressure, blood pressure-regulating mechanisms, and cardiovascular risk factors. Hypertension 46: 667-675.

90. Fagard RH (2001) Exercise characteristics and the blood pressure response to dynamic physical training. Med Sci Sports Exerc 33: S484-S492.

91. Jennings GL (1997) Exercise and blood pressure: Walk, run or swim? J Hypertens 15: 567-569.

92. Cardoso CG Jr, Gomides RS, Queiroz AC, Pinto LG, da Silveira Lobo F, et al. (2010) Acute and chronic effects of aerobic and resistance exercise on ambulatory blood pressure. Clinics (Sao Paulo) 65: 317-325.

93. Fagard RH (2005) Physical activity, physical fitness and the incidence of hypertension. J Hypertens 23: 265-267.

94. Kelley GA, Kelley KA, Tran ZV (2001) Aerobic exercise and resting blood pressure: A meta-analytic review of randomized, controlled trials. Prev Cardiol 4: 73-80.

95. Cornelissen VA, Fagard RH (2005) Effect of resistance training on resting blood pressure: A meta-analysis of randomized controlled trials. J Hypertens 23: 251-259.

96. Carpio-Rivera E, Moncada-Jiménez J, Salazar-Rojas W, Solera-Herrera A (2016) Acute effects of exercise on blood pressure: A meta-analytic investigation. Arq Bras Cardiol 106: 422-433.

97. Kokkinos PF, Narayan P, Colleran JA, Pittaras A, Notargiacomo A, et al. (1995) Effects of regular exercise on blood pressure and left ventricular hypertrophy in African-American men with severe hypertension. N Engl J Med 333: 1462-1467.

98. Blair SN, Goodyear NN, Gibbons LW, Cooper KH (1984) Physical fitness and incidence of hypertension in healthy normotensive men and women. JAMA 252: 487-490.

99. Haapanen N, Miilunpalo S, Vuori I, Oja P, Pasanen M (1997) Association of leisure time physical activity with the risk of coronary heart disease, hypertension and diabetes in middle-aged men and women. Int J Epidemiol 26: 739-747.

100. Paffenbarger Jr RS, Wing AL, Hyde RT, Jung DL (1983) Physical activity and incidence of hypertension in college alumni. Am J Epidemiol 117: 245-257.

101. Leitzmann MF, Park Y, Blair A, Ballard-Barbash R, Mouw T, et al. (2007) Physical activity recommendations and decreased risk of mortality. Arch Intern Med 167: 2453-2460.

102. Rossi A, Dikareva A, Bacon SL, Daskalopoulou SS (2012) The impact of physical activity on mortality in patients with high blood pressure: A systematic review. J Hypertens 30: 1277-1288.

103. James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, et al. (2014) 2014 evidence-based guideline for the management of high blood pressure in adults report from the panel members appointed to the Eighth Joint National Committee (JNC 8). JAMA 311: 507-520.

104. Mancia G, Fagard R, Narkiewicz K, Redón J, Zanchetti A, et al. (2013) 2013 ESH/ESC guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). J Hypertens 31: 1281-1357.

105. Stevens VJ, Corrigan SA, Obarzanek E, Bernauer E, Cook NR, et al. (1993) Weight loss intervention in phase 1 of the trials of hypertension prevention. The TOHP Collaborative Research Group. Arch Intern Med 153: 849-858.

106. Stevens VJ, Obarzanek E, Cook NR, Lee IM, Appel LJ, et al. (2001) Long-term weight loss and changes in blood pressure: Results of the trials of hypertension prevention, phase II. Ann Intern Med 134: 1-11.

107. Huang Z, Willett WC, Manson JE, Rosner B, Stampfer MJ, et al. (1998) Body weight, weight change, and risk for hypertension in women. Ann Intern Med 128: 81-88.

108. Neter JE, Stam BE, Kok FJ, Grobee DE, Geleijnse JM (2003) Influence of weight reduction on blood pressure: A meta-analysis of randomized controlled trials. Hypertension 42: 878-884.

109. (1997) Effects of weight loss and sodium reduction intervention on blood pressure and hypertension incidence in overweight people with high-normal blood pressure. The trials of hypertension prevention, phase II. The Trials of Hypertension Prevention Collaborative Research Group. Arch Intern Med 157: 657-667.

110. Langford HG, Blaufox MD, Oberman A, Hawkins CM, Curb JD, et al. (1985) Dietary therapy slows the return of hypertension after stopping prolonged medication. JAMA 253: 657-664.

111. Whelton PK, Appel LJ, Espeland MA, Applegate WB, Ettinger WH Jr, et al. (1998) Sodium reduction and weight loss in the treatment of hypertension in older persons: A randomized controlled trial of nonpharmacologic interventions in the elderly (TONE). TONE Collaborative Research Group. JAMA 279: 839-846.

112. Cappuccio FP, MacGregor GA (1991) Does potassium supplementation lower blood pressure? A meta-analysis of published trials. J Hypertens 9: 465-473.

113. Whelton PK, He J, Cutler JA, Brancati FL, Appel LJ, et al. (1997) Effects of oral potassium on blood pressure. Meta-analysis of randomized controlled clinical trials. JAMA 277: 1624-1632.

114. Geleijnse JM, Kok FJ, Grobbee DE (2003) Blood pressure response to changes in sodium and potassium intake: A meta-regression analysis of randomised trials. J Hum Hypertens 17: 471-480.

115. Ma J, Folsom AR, Melnick SL, Eckfeldt JH, Sharrett AR, et al. (1995) Associations of serum and dietary magnesium with cardiovascular disease, hypertension, diabetes, insulin, and carotid arterial wall thickness: The ARIC study. Atherosclerosis Risk in Communities study. J Clin Epidemiol 48: 927-940.

116. Cappuccio FP, Elliott P, Allender PS, Pryer J, Follman DA, et al. (1995) Epidemiologic association between dietary calcium intake and blood pressure: A meta-analysis of published data. Am J Epidemiol 142: 935-945.

117. Joffres MR, Reed DM, Yano K (1987) Relation of magnesium intake and other dietary factors to blood pressure: The Honolulu heart study. Am J Clin Nutr 45: 469-475.

118. Bucher HC, Cook RJ, Guyatt GH, Lang JD, Cook DJ, et al. (1996) Effects of dietary calcium supplementation on blood pressure: A meta-analysis of randomized controlled trials. JAMA 275: 1016-1022.

119. McCarron D (1998) Diet and blood pressure-the paradigm shift. Science 281: 933-934.

120. Margetts BM, Beilin LJ, Vandongen R, Armstrong BK (1986) Vegetarian diet in mild hypertension: A randomized controlled trial. BMJ 293: 1468-1471.

121. Appel L, Moore T, Obarzanek E, Vollmer WM, Svetkey LP, et al. (1997) A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. N Engl J Med 336: 1117-1124.

122. Lavie CJ, Milani RV, Mehra MR, Ventura HO (2009) Omega-3 polyunsaturated fatty acids and cardiovascular diseases. J Am Coll Cardiol 54: 585-594.

123. Tousoulis D, Plastiras A, Siasos G, Oikonomou E, Verveniotis A, et al. (2014) Omega-3 PUFAs improved endothelial function and arterial stiffness with a parallel antiinflammatory effect in adults with metabolic syndrome. Atherosclerosis 232: 10-16.

124. Bønaa KH, Bjerve KS, Straume B, Gram IT, Thelle D (1990) Effect of eicosapentaenoic and docosahexaenoic acids on blood pressure in hypertension. A population-based intervention trial from the Tromsø study. N Engl J Med 322: 795-801.

125. Prisco D, Paniccia R, Bandinelli B, Filippini M, Francalanci I, et al. (1998) Effect of medium-term supplementation with a moderate dose of n-3 polyunsaturated fatty acids on blood pressure in mild hypertensive patients. Thromb Res 91: 105-112.

126. Miller PE, Van Elswyk M, Alexander DD (2014) Long-chain Omega-3 fatty acids eicosapentaenoic acid and docosahexaenoic acid and blood pressure: A meta-analysis of randomized controlled trials. Am J Hypertens 27: 885-896.

127. Yang B, Shi MQ, Li ZH, Yang JJ, Li D (2016) Fish, long-chain n-3 PUFA and incidence of elevated blood pressure: A meta-analysis of prospective cohort studies. Nutrients 8.

128. Fuhrman B, Aviram M (2001) Flavonoids protect LDL from oxidation and attenuate atherosclerosis. Curr Opin Lipidol 12: 41-48.

129. Lopez-Miranda J, Perez-Jimenez F, Ros E, De Caterina R, Badimon L, et al. (2010) Olive oil and health: Summary of the II international conference on olive oil and health consensus report, Jaen and Cordoba (Spain) 2008. Nutr Metab Cardiovasc Dis 20: 284-294.

130. Cicero AF, Nascetti S, Lopez-Sabater MC, Elosua R, Salonen JT, et al. (2008) Changes in LDL fatty acid composition as a response to olive oil treatment are inversely related to lipid oxidative damage: The EUROLIVE Study. J Am Coll Nutr 27: 314-320.

131. Shantsila E, Wrigley BJ, Blann AD, Gill PS, Lip GY (2012) A contemporary view on endothelial function in heart failure. Eur J Heart Fail 14: 873-881.

132. Schwingshackl L, Christoph M, Hoffmann G (2015) Effects of olive oil on markers of inflammation and endothelial function- a systematic review and meta-analysis. Nutrients 7: 7651-7675.

133. Kokkinos P, Panagiotakos DB, Polychronopoulos E (2005) Dietary influences on blood pressure: The effect of the Mediterranean diet on the prevalence of hypertension. J Clin Hypertens (Greenwich) 7: 165-170.

134. Pitsavos C, Panagiotakos DB, Chrysohoou C, Papaioannou I, Papadimitriou L, et al. (2003) The adoption of Mediterranean diet attenuates the development of acute coronary syndromes in people with the metabolic syndrome. Nutr J 2: 1.

135. Trichopoulou A, Costacou T, Bamia C, Trichopoulos D (2003) Adherence to a Mediterranean diet and survival in a Greek population. N Engl J Med 348: 2599-2608.

136. Schroder H, Schmelz E, Marrugat J (2002) Relationship between diet and blood pressure in a representative Mediterranean population. Eur J Nutr 41: 161-167.