Journal of Clinical & Experimental Cardiology

Kones and Rumana, J Clin Exp Cardiolog 2016, 7:8
DOI: 10.4172/2155-9880.1000e145

Editorial Open Access

Nutrition Studies, Optimum Cardiovascular Health, and Coronary Atherosclerosis-Ensuring A Solid Foundation for Public Policy

Richard Kones*and Umme Rumana

Cardiometabolic Research Institute, Houston, Texas, USA

***Corresponding author:** Richard Kones, MD, FAHA, FESC, FRSM, FRSH, FCP, Director, Cardiometabolic Research Institute, 8181 Fannin Street, Bldg #3, Unit #314, Houston, Texas, USA, Tel: 77054-2913; E-mail: medkones@gmail.com

Received date: August 11, 2016; **Accepted date:** August 20, 2016; **Published date:** August 22, 2016

Keywords: Coronary heart disease; Cardiovascular risk; Cardiovascular disease; Atherosclerosis; Diet; Primordial prevention; Acute coronary syndrome; Lifestyle therapies

Editorial

Coronary heart disease (CHD), the leading cause of death worldwide, is ideally managed through a combination of lifestyle change, optimum medical care, and interventional therapies, including surgery [1]. These three modalities are partners, rather than competitors, from which cardiologists and patients may chose, according to evidence, patient needs, and preferences. While genetic predisposition is important, diet, lifestyle choices, and other modifiable factors account for about 70% to 90% of CHD pathology [2-5], and are reviewed elsewhere [6-8]. This commentary reflects upon the need for better diet studies, the continuing high burden of cardiovascular risk, particularly obesity and type 2 diabetes (T2D), and the concept that atherosclerosis is a systemic disease.

The relationship of diet and lifestyle to heart disease has been appreciated for over 40 years, and yet despite a cohesive basic core of nutrition fundamentals, significant advances, and a tsunami of literature, achieving the potential of cardiovascular prevention remains elusive [9-11]. Major barriers do not include lack of knowledge, but involve adoption, implementation, the environment, and social determinants [12-14].

Counterproductive controversy about some issues has become fashionable, but it is not necessary to cite debated issues when recommending smaller portions, more fresh produce, additional fiber, fewer processed foods (especially meats), controlled salt and sugar intake, and greater physical activity (especially avoidance of prolonged sitting) to the public. Most concerning is the minimal improvement in the U. S. diet, which is still considered poor [12,13]. All told, despite all intermediary and putative explanations, the prevalence of ideal cardiovascular health has not meaningfully changed in the past decade, and remains so even when using self-reported data [15,16]. With respect to the six aforementioned items, individual behavior remains the most important factor, rather than guideline failure [17]. Therefore it is not surprising that background cardiovascular risk and subclinical CHD in asymptomatic individuals remains relatively high, as evidenced by positive calcium artery scores in over half of ostensibly healthy rural U. S. adults younger than 65 years [18]. Since this score is associated with the number, duration, and intensity of risk factors present, including obesity and T2D, behavioral/lifestyle modification as part of prevention programs needs much more attention, as outlined in recent ESC Guidelines [19].

- Inadequate consideration of what types of fats and carbohydrates were consumed (added sugars vs simple sugars vs fiber; subdivisions of fats consumed)
- Details about other macronutrients nutrients substituted when the macronutrient of interest was either decreased or increased
- Inadequate duration of the studies (especially compared to the natural history of physiological changes and small effect sizes)
- Small sample sizes
- Underpowering
- Objective measurements of so-called "isocaloric" substitutions
- Inadequate surrogates
- High dropout rates
- Intentional/unintentionally poor adherence, in many cases trivializing the differences between groups
- Unrecognized confounding, eg, from prescribed psychotropic drugs that affect appetite
- Recognized or unanticipated confounding from intake of other foods/substances, eg, OTC products)
- Use of questionnaires and other self-reported data
- Failure to consider cultural variations
- Differential concomitant medical treatment (by uninvolved providers) in different arms that effect output variables
- Injection of beliefs beyond what the evidence justifies
- Research lacking probative value
- Curious admixtures of emotional, arcane, or irrelevant arguments and/or agendas
- "Fuzzy endpoints" (weight loss vs cardiovascular health, vs general health)
- Biased research reporting
- Conflicts of interest
- Political influence in evaluation and public policy

Figure 1: Potential pitfalls in published dietary interventions included in this.

At times, and in combination, these have generally led to a high proportion of both false positive and false negative findings, accompanied by correspondingly poor evaluations [20]. A few of these challenges are discussed, in a number of different forums, by several investigators (Figure 1) [11-13,21-24].

In the low-fat *vs* low-carbohydrate debate, program designs did not succeed in elimination of potential barriers over a period of three decades and considerable investment of resources, despite the call for a large, sufficiently powered study of adequate duration. Unfortunately, the associated mêlée diminished the value of science and objectivity, lowered probability of definitive work, and allowed commercial interests, media pieces, and agendas to prevail. The implausibility and absurdity of repeating the same errors over and over in interventions is expertly discussed by Ioannidis [20] and in the citations to his editorial.

To remove many of the confounding variables, Hall et al. [25] conducted a "metabolic intervention" While this effort was small and of short duration, it was meticulously controlled. Calorie for calorie, dietary fat restriction resulted in more body fat loss than carbohydrate

restriction in people with obesity. This type of information provides a basis for future work as part of an objective, rigorous approach to nutrition studies [26].

The saturated fat-cardiovascular disease risk (CVD) association is another "controversy" characterized by misinformation and confusing dialogue. A panoramic analysis was provided by Stamler [27], where essential references appear. The evidence was evaluated by the U. S. Dietary Guidelines Advisory Committee [22] whose recommendations —in a transient triumph of the scientific method—were later modified. Reframing the question by replacing 5% of saturated fat intake isocalorically from polyunsaturated- and monounsaturated-fatty acids reduced mortality risk by 27% and 13% respectively [28]. Dietary saturated fat does in fact contribute to CV risk, and replacement with polyunsaturated fat or whole-grain carbohydrates improves risk [29]. No advantage in outcomes is achieved by replacing with mixed carbohydrates, or for that matter, butter [30].

As mentioned, it is possible to offer sound dietary advice while avoiding issues that distract or impede patient motivation for behavior change. Even though improvement in dietary studies is desirable, existing information, which can eliminate most of clinical arteriosclerosis right now, continues to be disregarded. Most assuredly, the rate of decrease in CHD mortality has leveled from 2011-2014, and the likely culprits are the dual epidemics of obesity and T2D [31]. Advances made in controlling prevalence of smoking, dyslipidemia and hypertension are being offset by rises in corpulence and dysglycemia, amply justifying innovative and intensive prevention through diet and lifestyle.

Serial imaging of the arterial wall has enabled greater understanding of both the natural progression of arteriosclerotic plaques and effects of interventions [32]. Multi-imaging identified lesions in 63% of an asymptomatic middle-aged population, as well as intermediate or generalized disease in 41% of the cohort, with frequency rising in proportion to a 10-year risk score [33]. As plaque develops, clinically silent growth usually occurs outward into the vessel wall rather than encroaching upon the lumen, leading to independence between plaque size and limitation in blood flow. The focal, fixed, stenosis view of acute coronary syndromes (ACS) has therefore been modified according to recent data [34]. Intracoronary imaging has also provided evidence that challenges the "vulnerable plaque" hypothesis, which proposed ACS are predominantly due to thin-capped lesions with underlying lipid-laden cores [35]. Indeed, perhaps only 5% of the vast number of such "vulnerable" plaques does actually rupture [36]. Plaque erosion seems to be the more common ACS mechanism, in relation to the progressive increase in frequency of non-ST segment elevation myocardial infarction [37]. This trend applies to lesions developing in both asymptomatic and diagnosed patients. Greater statin use may account for plaque stabilization in the latter, due to lipid-lowering, anti-inflammatory, and other pleiotropic actions. In this regard, it should be mentioned that even in the current era of statin therapy, however, there is considerable on-treatment residual risk that remains unaddressed [38,39].

Patients with ACS due to culprit lesions with an intact fibrous plaque (including plaque erosion) fare better than those with plaque rupture. While the details of the underlying pathology are significant and may have prognostic value, unfortunately no diagnostic technique is able to survey multiple lesions and identify those posing imminent danger [40].

In summary, arteriosclerosis occurs in multiple vessels concomitantly, and in the coronary tree, plaque occurs diffusely and in various stages of maturation and resolution. New mechanistic data regarding the prolonged pathogenesis and ubiquity of coronary lesions lends support to systemic therapies. Diet and lifestyle improvements offer a simple, safe, thorough, cost-effective solution, and are recommended in all guidelines as first-line therapy. This approach also promotes plaque regression and stabilization due to both anti-inflammatory and lipid-lowering mechanisms [41], and simultaneously improves weight, blood pressure, and hyperglycemia. The effectiveness of lifestyle programs is well-accepted, is reflected in risk scores and dietary indices, and is supported by a burgeoning literature [9,42,43].

Despite the need for improvement, there is an accepted core of dietary knowledge that, together with other lifestyle measures, effectively prevents and treats obesity, T2D, and related CVD. Unfortunately, prevention is underutilized for a number of reasons. Unless the present trajectory is reversed, past gains in CHD mortality will be eroded, and successes in controlling other risk factors will be threatened. In addition, newer techniques indicate that CHD is a diffuse, systemic disease, in which systemic therapies play a key role. Soft, fatty uncalcified lesions in asymptomatic individuals constitute the substrate from which most CV events eventually arise. Since primordial prevention offers more complete protection than optimum therapies after risk factors appear, nutritional and lifestyle medicine have become even more important.

References

1. Writing Group Members, Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, et al. (2016) Heart Disease and Stroke Statistics-2016 Update: A Report From the American Heart Association. Circulation 133: e38-360.
2. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, et al. (2004) Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet 364: 937-952.
3. Kovacic S, Bakran M (2012) Genetic susceptibility to atherosclerosis. Stroke Res Treat 2012: 362941.
4. Willett WC (2002) Balancing life-style and genomics research for disease prevention. Science 296: 695-698.
5. Walter S, Mejía-Guevara I, Estrada K, Liu SY, Glymour MM (2016) Association of a Genetic Risk Score With Body Mass Index Across Different Birth Cohorts. JAMA 316: 63-69.
6. Kones R (2011) Is prevention a fantasy, or the future of medicine? A panoramic view of recent data, status, and direction in cardiovascular prevention. Ther Adv Cardiovasc Dis 5: 61-81.
7. Kones R (2011) Primary prevention of coronary heart disease: integration of new data, evolving views, revised goals, and role of rosuvastatin in management. A comprehensive survey. Drug Des Devel Ther 5: 325-380.
8. Kones R (2013) Molecular sources of residual cardiovascular risk, clinical signals, and innovative solutions: relationship with subclinical disease, undertreatment, and poor adherence: implications of new evidence upon optimizing cardiovascular patient outcomes. Vasc Health Risk Manag 9: 617-670.
9. van Dam RM, Willett WC (2009) Unmet potential for cardiovascular disease prevention in the United States. Circulation 120: 1171-1173.
10. Willett WC, Stampfer MJ (2013) Current evidence on healthy eating. Annu Rev Public Health 34: 77-95.
11. Katz DL, Meller S (2014) Can we say what diet is best for health? Annu Rev Public Health 35: 83-103.
12. Avendano M, Kawachi I (2014) Why do Americans have shorter life expectancy and worse health than do people in other high-income countries? Annu Rev Public Health 35: 307-325.

13. Wang DD, Leung CW, Li Y, Ding EL, Chiuve SE, et al. (2014) Trends in dietary quality among adults in the United States, 1999 through 2010. JAMA Intern Med 174: 1587-1595.
14. Wang DD, Li Y, Chiuve SE, Hu FB, Willett WC (2015) Improvements In US Diet Helped Reduce Disease Burden And Lower Premature Deaths, 1999-2012; Overall Diet Remains Poor. Health Aff (Millwood) 34: 1916-1922.
15. Huffman MD, Lloyd-Jones DM, Ning H, Labarthe DR, Guzman Castillo M, et al. (2013) Quantifying options for reducing coronary heart disease mortality by 2020. Circulation 127: 2477-2484.
16. Liu Y, Croft JB, Wheaton AG, Kanny D, Cunningham TJ, et al. (2016) Clustering of Five Health-Related Behaviors for Chronic Disease Prevention Among Adults, United States, 2013. Prev Chronic Dis 13: E70.
17. Loprinzi PD, Branscum A, Hanks J, Smit E (2016) Healthy Lifestyle Characteristics and Their Joint Association With Cardiovascular Disease Biomarkers in US Adults. Mayo Clin Proc 91: 432-442.
18. Mamudu HM, Paul T, Veeranki SP, Wang L, Panchal HB, et al. (2015) Subclinical Atherosclerosis and Relationship With Risk Factors of Coronary Artery Disease in a Rural Population. Am J Med Sci 350: 257-262.
19. Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, et al. (2016) European Guidelines on cardiovascular disease prevention in clinical practice. Eur Heart J.
20. Ioannidis JP (2013) Implausible results in human nutrition research. BMJ 347: f6698.
21. Anderson JW, Konz EC, Frederich RC, Wood CL (2001) Long-term weight-loss maintenance: a meta-analysis of US studies. Am J Clin Nutr 74: 579-584.
22. Dietary Guidelines Advisory Committee (2015) Scientific Report of the 2015 Dietary Guidelines Advisory Committee. Washington, DC: Office of Disease Prevention and Health Promotion, U.S. Department of Health and Human Services.
23. Johnston BC, Kanters S, Bandayrel K, Wu P, Naji F, et al. (2014) Comparison of Weight Loss Among Named Diet Programs in Overweight and Obese Adults: A Meta-analysis. JAMA 312: 923-33.
24. Thompson FE, Subar AF (2013) Dietary Assessment Methodology. In Coulston, A. M., Boushey, C. J., & Ferruzzi, M. G. Nutrition in the prevention and treatment of disease.
25. Hall KD, Bemis T, Brychta R, Chen KY, Courville A, et al. (2015) Calorie for Calorie, Dietary Fat Restriction Results in More Body Fat Loss than Carbohydrate Restriction in People with Obesity. Cell Metab 22: 427-436.
26. Ioannidis JPA (2016) We need more randomized trials in nutrition-preferably large, long-term, and with negative results. Am J Clin Nutr 103: 1385-1386.
27. Stamler J (2010) Diet-heart: a problematic revisit. Am J Clin Nutr 9, 497-499.
28. Wang DD, Li Y, Chiuve SE, Meir J, Stampfer MJ, Manson JE, et al. (2016) Association of Specific Dietary Fats With Total and Cause-Specific Mortality. JAMA Intern Med 176:1134-1145.
29. Li Y, Hruby A, Bernstein AM, Ley SH, Wang DD, et al. (2015) Saturated Fats Compared With Unsaturated Fats and Sources of Carbohydrates in Relation to Risk of Coronary Heart Disease: A Prospective Cohort Study. J Am Coll Cardiol 66: 1538-1548.
30. Pimpin L, Wu JHY, Haskelberg H, Del Gobbo L, Mozaffarian D (2016) Is Butter Back? A Systematic Review and Meta-Analysis of Butter Consumption and Risk of Cardiovascular Disease. Diabetes, and Total Mortality. PLoS ONE 11: e0158118.
31. Sidney S, Quesenberry CP Jr, Jaffe MG, Sorel M, Nguyen-Huynh MN, et al. (2016) Recent Trends in Cardiovascular Mortality in the United States and Public Health Goals. JAMA Cardiol 1: 594-599.
32. Andrews J, Puri R, Kataoka Y, Nicholls SJ, Psaltis PJ (2016) Therapeutic modulation of the natural history of coronary atherosclerosis: lessons learned from serial imaging studies. Cardiovasc Diagn Ther 6: 282-303.
33. Fernandez-Friera L, Penalvo JL, Fernandez-Ortiz A, Borja Ibañez B, López-Melgar B, et al. (2015) Prevalence, vascular distribution, and multiterritorial extent of subclinical atherosclerosis in a middle-aged cohort: the PESA (Progression of Early Subclinical Atherosclerosis) Study. Circulation 131: 2104-2113.
34. Libby P (2013) Mechanisms of acute coronary syndromes and their implications for therapy. N Engl J Med 368: 2004-2013.
35. Crea F, Liuzzo G (2013) Pathogenesis of acute coronary syndromes. J Am Coll Cardiol 61: 1-11.
36. Stone GW, Maehara A, Lansky AJ, de Bruyne B, Cristea E, et al. (2011) A prospective natural-history study of coronary atherosclerosis. N Engl J Med 364: 226-235.
37. Libby P, Pasterkamp G (2015) Requiem for the 'vulnerable plaque'. Eur Heart J 36: 2984-2987.
38. Kones R, Rumana U (2015) Current Treatment of Dyslipidemia: A New Paradigm for Statin Drug Use and the Need for Additional Therapies. Drugs 75: 1187-1199.
39. Kones R, Rumana U (2015) Current Treatment of Dyslipidaemia: Evolving roles of non-statin and newer drugs. Drugs. (Springer) 75:1201-1228.
40. Niccoli G, Montone RA, Di Vito L, Gramegna M, Refaat H, et al. (2015). Plaque rupture and intact fibrous cap assessed by optical coherence tomography portend different outcomes in patients with acute coronary syndrome. Eur Heart J 36: 1377-1384.
41. Armstrong ML, Heistad DD, Marcus ML, Piegors DJ, Abboud FM (1983) Hemodynamic sequelae of regression of experimental atherosclerosis. J Clin Invest 71: 104-113.
42. Tuso PJ, Ismail MH, Ha BP, Bartolotto C (2013) Nutritional update for physicians: plant-based diets. Perm J 17: 61-66.
43. Razavi M, Fournier S, Shepard DS, Ritter G, Strickler GK, et al. (2014) Effects of lifestyle modification programs on cardiac risk factors. PLoS One 9: e114772.