Nutrition xxx (2014) 1–5

Contents lists available at ScienceDirect

Nutrition

journal homepage: www.nutritionjrnl.com

Proceedings of meetings

Prevention strategies for cardiovascular diseases and diabetes mellitus in developing countries: World Conference of Clinical Nutrition 2014

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ARTICLE INFO

Article history:
Received 18 November 2013
Accepted 7 December 2013

Keywords:
Cardiovascular disease
Diabetes
Nutrition
Hypertension
Heart disease
Policy

ABSTRACT

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Introduction

On Oct. 24 to 26, 2013, the 7th International Congress on Cardiovascular Diseases and the 17th World Congress on Clinical Nutrition took place in Sofia, Bulgaria (www.iccsk.bizpa.in).

KH and IS contributed equally to this article. IS is supported by the Global Platform for Research Leaders scheme. The authors have no financial disclosures or conflicts of interest.

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http://dx.doi.org/10.1016/j.nut.2013.12.013

Table 1
Nutrition in transition and emergence of non-communicable diseases in developing countries

Homo sapiens diet given in tables 1–5	Pattern 1: Hunter–gatherers	Pattern 2: Food scarcity & poverty	Pattern 3: Receding food scarcity & poverty	Pattern 4: More food, less execise—Homo economicus	Pattern 5: Healthy behavior—Homo modestis
Nutrition profile					
Diet	Plants, low-fat wild animals, diet diversity by collecting foods.	Cereals predominant, diet less varied	*Fewer starchy staples; more fruit, vegetables, animal protein; low variety continues*	More fat (animal products, trans-fat, ω-6 fat), sugar, processed foods; less fiber, less ω-3 fat and flavonoids	Higher-quality fats, reduced refined carbohydrates, more whole grains, fruit, vegetables rich in ω-3 and flavonoids
Nutritional status	Robust, lean population; few nutritional deficiencies	Children and women suffer most from low-fat intake, nutritional-deficiency disease emerge, stature declines	Continued MCH nutrition problems, many deficiencies disappear, weaning diseases emerge, stature grows	Obesity, problems for elderly (osteoporosis, fractures etc), type 2 diabetes, hypertension, stroke, heart attack, brain degeneration, Psychological disorders, cancer	Reduction in body fat and obesity, and NCDs, improvement in bone health Epigenetic modulation and transgenerational epigenetic inheritance-natural selection.
Economy	Hunter–gatherers	Agriculture, animal husbandry, homemaking begin; shift to monocumono cultures	Second agricultural revolution (crop rotation, fertilizer), Industrial Revolution, women join labor force	Fewer jobs with heavy physical activity, service sector and mechanization, household technology revolution	Service-sector mechanization and industrial robotization dominate, increase in leisure exercise offsets sedentary jobs
Household	Primitive, onset of fire	Labor-intensive, primitive technology begins (clay cooking vessels)	Primitive water systems, clay stoves, cooking technology advances	Household technology mechanizes and proliferates	Significant reduction in food preparation costs as a result of technological change
Income and assets	Subsistence, primitive stone tools	Subsistence, few tools	Increases in income disparity and agricultural tools industrialization	Rapid growth in income and income disparities, technology proliferation	Decrease in income growth, increase in home and leisure technologies
Professional skill/ education	Hunting	Stock breeding, cultivation	Industry, intensive agriculture	Processed unhealthy foods increased	Functional foods availability increases
Demographic profile					
Mortality	Low fertility, high mortality, low life expectancy	Age of malthus; high natural fertility, short life expectancy, high infant and maternal mortality	Mortality declines slowly, then rapidly; fertility static, then declines; small, cumulative population growth, which later explodes	Life expectancy hits unique levels (ages 60–70 y), huge decline and fluctuations in fertility (e.g., postwar baby boom)	Life expectancy extends to ages 70 and 90 y, disability-free period increases
Age structure	Young population	Young, very few elderly	Chiefly young, shift to older population begins	Rapid decline in fertility, rapid increase in proportion of elderly person	Increases in the proportion of elderly >75 y of age
Housing	Rural, low density	Rural, a few small, crowded cities	Chiefly rural, move to cities increases, international migration begins, megacities develop	Dispersal of urban population decrease in rural green space	Lower-density cities rejuvenate, increase in urbanization of rural areas encircling cities
Food processing	Nonexistent	Food storage begins	Storage processes (drying, salting) begin, canning and processing technologies emerge, increases in food refining and milling	Numerous food-transforming technologies	Technologies create functional foods and food constituent substitutes (e.g., macronutrient substitutes)

MCH, maternal and child health; NCD, non-communicable disease
Modified from Popkin et al., 2006.

During the meetings, we reiterated that treatment decisions on cardiovascular disease (CVD) and diabetes mellitus should target the overall level of risks in each patient including biological risk factors and other social and environmental determinants [1–4]. In particular, behavioral and lifestyle interventions have been shown to reduce CVD risk factors in affluent countries, whereas studies of cardiovascular preventive interventions are much needed in low- and middle-income settings [5]. Strengthening well-functioning national health systems in developing countries should be a real focus [6] because management of non-communicable diseases would help sustain human development capital [7]. The International College of Nutrition and International College of Cardiology have been emphasizing the role of nutrition and health knowledge in the prevention strategies of CVD and diabetes in local health education since the 1990s. For example, poverty may have been long blamed for its effect on risk for CVD and diabetes mellitus in the developing countries. However, we have now observed that, in fact, by offering proper health education through day-to-day clinical practice to the most deprived areas in coordination with revisting public heath policy on a regular basis could better achieve the overall physical, mental, social, and environmental aspects of patient health [8–10]. To be specific, it is not

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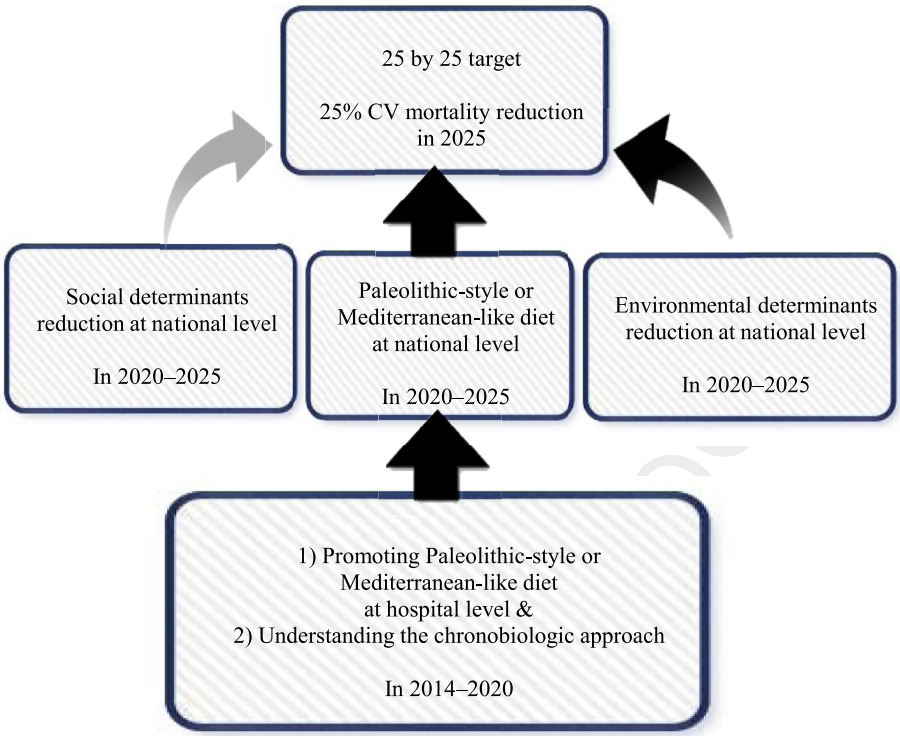

Fig. 1. Promotion of Paleolithic-style or Mediterranean-like diet to target "25 by 25." CV, cardiovascular.

being poor that directly causes CVD, diabetes, or both [11]. Rather, it is the unchanged poor environmental condition (i.e., a lack of healthy foods) and unhealthy behaviors since early years [12] and the advancement of diagnostic technology to disclose the disease burden and patterns that cannot reduce the number of CVD events and mortality [13]. Following this context, we propose that the use of a national-level tax system might be the most cost-effective way to improve local and national public health. In this way, we believe that in the long run, health care spending could be largely reduced and human development capital could be sustained over the next decades. More importantly, because nutrition has been claimed to have a positive effect throughout one's life span [14,15], working with food industries and governments to reach a consensus on making healthy foods available at reasonable and affordable costs would be a continuous challenge.

Nutrition transition and the development of CVD and diabetes in developing countries

The major changes in risk factors for CVD have mainly occurred in the past century as a result of industrialization and urbanization leading to rapid changes in diet and lifestyle that have greatly influenced certain regions and then the rest of the world [16,17]. Unfortunately, it is largely the capitalist culture that has brought serious effects to many societies in developing countries. In addition to the known biological risk factors for CVD and diabetes, other factors (Table 1) such as sex, work, diet, sedentary lifestyle, environmental pollutants, housing, sleep quality, mental problems have been getting more attention because developing countries are the largest consuming entities following the capitalist culture brought by certain developing countries [18]. These have continued changing our living environments and individual biological reactions and responses [19] as a result of the inbalanced social justice resulting in double burden [20] and loss of sustainability.

Paleolithic style diet and risk for CVD and diabetes in developing countries

Dietary intake and lifestyle have changed significantly over the past century; intake of refined carbohydrates, saturated fatty acids, trans-fat, and ω-6 fat increased and that of ω-3 fatty acids decreased. During the Paleolithic era, the diet of hunter–gatherers comprised mainly fruits, vegetables, seeds, whole grains, egg, fish, and wild animal meat, which were low in ω-6 and high in ω-3 fatty acids along with antioxidants, vitamins and minerals, and amino acids. The pathway from nutrition to obesity and then CVD and diabetes is largely explained by social and physical environments rather than genetics [21]. Prospective studies and clinical trials have shown that adherence to the Mediterranean diet [22,23] was associated with reduced risk for CVD and metabolic syndrome. Effects on other biomarkers [23] included waist circumference (−0.42 cm; 95% confidence interval [CI], −0.82 to −0.02), high-density lipoprotein cholesterol (1.17 mg/dL; 95% CI, 0.38–1.96), triacylglycerols (−6.14 mg/dL; 95% CI, −10.35 to −1.93), systolic blood pressure (−2.35mm Hg; 95% CI, −3.51 to −1.18), diastolic blood pressure (−1.58mm Hg; 95% CI, −2.02 to −1.13), and glucose (−3.89 mg/dL; 95% CI, −5.84 to −1.95). The large population-based INTERHEART study involving 52 countries [24] confirmed previous single within-population cohort studies, revealing an inverse association between the prudent pattern score and risk for acute coronary syndrome (ACS) and a significant positive association between the Western pattern score and increased risk for ACS. Although no association was found between a particular Oriental

diet and ACS risk, some foods might be classified as unhealthy. Despite different food habits in various populations, reproducible patterns can be found in diverse regions of the world.

Using a Paleolithic-style diet as an intervention (n = 204 intervention group, n = 202 control group), a significant decline was found in total cardiac events and in total mortality after 6 wk of follow-up in India [25,26]. The benefits were found to last for up to 2 y [27]. In another reinfarction trial, it was demonstrated that modest intake of fish (two servings/wk), could decrease total cardiovascular mortality by 29% [28] as previously reported. However, no benefit was observed in non-fatal infarction. The authors concluded that ω-3 fatty acids may have prevented ventricular fibrillation by altering cardiomyocyte cell membrane phospholipids. The protective effect of the Paleolithic prudent diet may be related to low ω-6 fatty acids and high content of α-linolenic acid, antioxidants, flavonoids, vitamins, amino acids, and carotinoids. These nutrients are known to decrease biomarkers such as inflammation, insulin resistance, and blood lipids [29]. Because inflammation, hyperlipidemia, hyperglycemia, free radical stress, and insulin resistance are basic mechanisms responsible for CVD and other chronic diseases, a Mediterranean-like diet can protect against these problems in both developed and developing countries.

Moreover, a study in India [30], tested an Indo-Mediterranean diet in 1000 patients with existing coronary disease or at high risk for coronary disease. Of the 1000 patients, 499 were administered a diet rich in fruits, vegetables, whole grains, walnuts, mustard and soy bean oil as a source for ω-3 fat. The remaining 501 patients were advised to follow the prudent diet recommended by the National Cholesterol Education Program (Step 1 diet in 1988). At the end of 2-y follow-up, the intervention group that had consumed significantly more fruits, vegetables, and legumes had better outcomes (less total cardiac events, sudden cardiac death, and non-fatal infarction) than the control group (537 ± 127 versus 231 ± 19 g/d; $P < 0.001$). Whether the Mediterranean-like diet prevented cardiac events with its influence on brain function by its action on the circadian system [31] remains to be further examined.

Vision for the next step

Tackling the burden of CVD and diabetes in developing countries apparently also requires an integrated approach involving governments (as European Union Commissioner of Health Tonio Borg claimed [32]), nongovernmental organizations, local schools and communities, food industries, and so on, where appropriate. Of note, using the chronobiologic approach seems to additionally advance the treatment of vascular variability disorders and has reduced the number of strokes and overall cardiovascular events by more than a factor of 2, according to recent experience [33]. We concur with a recent statement from Global Cardiovascular Disease Taskforce [34–36] that sharing best practices to reduce the overall level of biological CVD risks, following a successful health heart program as done in Iran [37], aligning measurements, fostering expertise, advancing implementation strategies, and providing national and local leadership all are crucial for the long-term efforts to reduce CVD and diabetes in developing countries. To be specific, in line with the global target of "25 by 25" (reducing 25% of cardiovascular mortality by 2025) initiated by World Heart Federation [38], we aim to widely promote a Paleolithic-style or Mediterranean-like diet together with a chronobiologic approach in developing countries from the local hospital level to the national level over the next decade (Fig. 1). We propose training medical professionals in the Paleolithic-style or Mediterranean-like diet so they can adequately introduce and promote these specific diets to existing patients, prospective outpatients, and their family members as interventions. Furthermore, we propose a national primary prevention initiative that encourages healthy citizens to adopt these diets at an early age. Specific nutritional needs, such as suitable micronutrients for the elderly, also would need to be considered and then implemented through special channels [39] because this population is more vulnerable than healthy, younger adults. This is a continuous challenge that relies on firm commitment from governments and hospitals in developing countries. Although Rome was not built in a day, we urge the activity to begin now and that support be given from all levels.

References

[1] Singh RB, Hristova K, Muthusamy VV, Basu TK, Rastogi SS, Toda E, et al. The adverse effects of wealth on cardiovascular health: a scientific statement of the International College of Cardiology. Cardiol Angiol An Int J 2013;1:9–22.
[2] Singh RB, Indian Consensus Group. Prevalence and prevention of hypertension, diabetes mellitus, and coronary artery disease in India. A scientific statement of the Indian Society of Hypertension, International College of Nutrition and International College of Cardiology. World Heart J 2010;2:31–44.
[3] Singh RB, De Meester F, Wilczynszka A, Takahashi T, Juneja L, Watson RR. Can a changed food industry prevent cardiovascular diseases? World Heart J 2013;5:1–8.
[4] World Health Organization. The 2008 to 2013 action plan for the global strategy for the prevention and control of noncommunicable diseases. Available at: http://www.who.int/nmh/Actionplan-PC-NCD-2008.pdf, accessed. Q2
[5] Shroufi A, Chowdhury R, Anchala R, Stevens S, Blanco P, Han T, et al. Cost effective interventions for the prevention of cardiovascular disease in low and middle income countries: A systematic review. BMC Public Health 2012;13:285.
[6] Samb B, Desai N, Nishtar S, Mendis S, Bekedam H, Wright A, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low-income and middle-income countries. Lancet 2010;376:1785–97.
[7] Clark H. NCDs: a challenge to sustainable human development. Lancet 2013;381:510–1.
[8] Singh RB, Kumar A, Neki NS, Pella D, Rastogi SS, Basu TK, et al. Diet and lifestyle guidelines and desirable levels of risk factors for prevention of cardiovascular disease and diabetes among elderly subjects. A revised scientific statement of the International College of Cardiology and International College of Nutrition—2011. World Heart J 2011;3:305–20.
[9] Indian Consensus Group. Indian consensus for prevention of hypertension and coronary artery diseases: a joint scientific statement of Indian Society of Hypertension and International College of Nutrition. J Nutr Envirn Med 1996;6:309–18.
[10] Singh RB, Hideki M, Junshi C, Mendis S, Moshiri M, Shoumin Z, et al. Recommendations for the prevention of coronary artery disease in Asians: a scientific statement of the International College of Nutrition. J Cardiovas Risk 1996;3:489–94.
[11] Singh RB, Anjum B, Takahashi T, Martyrosyan DM, Pella D, De Meester F, et al. Poverty is not the absolute cause of deaths due to non-communicable diseases NCDs. World Heart J 2012;4:221–36.
[12] McEniry M. Early-life conditions and older adult health in low- and middle-income countries: a review. J Dev Orig Health Dis 2013;4:10–29.
[13] Singh RB, Fedacko J, Vargova V, Kumar A, Mohan A, Pella D, et al. Singh's verbal autopsy questionnaire for assessment of causes of death, social autopsy, tobacco autopsy, and dietary autopsy based on medical records and interview. Acta Cardiol 2011;66:471–81.
[14] Rosenberg IH. Editorial: nutrition and the biology of human ageing: proceedings of the ninth Nestlé International Nutrition Symposium. J Nutr Health Aging 2013;17:706.
[15] Corvalán C, Kain J, Weisstaub G, Uauy R. Impact of growth patterns and early diet on obesity and cardiovascular risk factors in young children from developing countries. Proc Nutr Soc 2009;68:327–37.
[16] Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. Nutr Rev 2012;70:3–21.
[17] Gupta N, Shah P, Nayyar S, Misra A. Childhood obesity and the metabolic syndrome in developing countries. Indian J Pediatr 2013;80(Suppl 1):S28–37.
[18] Misra A, Singhal N, Khurana L. Obesity, the metabolic syndrome, and type 2 diabetes in developing countries: role of dietary fats and oils. J Am Coll Nutr 2010;29(Suppl):289S–301S.
[19] Prentice AM, Moore SE. Early programming of adult diseases in resource poor countries. Arch Dis Child 2005;90:429–32.
[20] Amuna P, Zotor FB. Epidemiological and nutrition transition in developing countries: Impact on human health and development. Proc Nutr Soc 2008;67:82–90.

Please cite this article in press as: Hristova K, et al., Prevention strategies for cardiovascular diseases and diabetes mellitus in developing..., Nutrition (2014), http://dx.doi.org/10.1016/j.nut.2013.12.013

[21] Popkin BM. Nutrition in transition: the changing global nutrition challenge. Asia Pac J Clin Nutr 2001;10(Suppl):S13–8.
[22] Sofi F, Abbate R, Gensini GF, Casini A. Accruing evidence about benefits of adherence to Mediterranean diet on health: an updated systematic review with meta-analysis. Am J Clin Nutr 2010;92:1189–96.
[23] Kastorini CM, Milionis HJ, Esposito K, Giugliano D, Goudevenos JA, Panagiotakos DB. The effect of Mediterranean diet on metabolic syndrome and its components. JACC 2011;57:1299–313.
[24] Iqbal R, Anand S, Ounpuu S, Islam S, Zhang X, Rangarajan S, et al, INTERHEART Study Investigators. Dietary patterns and the risk of acute myocardial infarction in 52 countries. Circulation 2008;118:1929–37.
[25] Singh RB, Rastogi SS, Verma R, Bolaki L, Singh R, Ghosh S. An Indian experiment with nutritional modulation in acute myocardial infarction. Am J Cardiol 1992;69:879–85.
[26] Singh RB, Rastogi SS, Verma R, Laxmi B, Singh R, Ghosh S, et al. Randomized, controlled trial of cardioprotective diet in patients with acute myocardial infarction: Results of one year follow up. BMJ 1992;304:1015.
[27] Singh RB, Fedacko J, Vargova V, Niaz MA, Rastogi SS, Ghosh S. Effect of low W-6/W-3 ratio fatty acid Paleolithic style diet in patients with acute coronary syndromes. A randomized, single blind, controlled trial. World Heart J 2012;4:71–84.
[28] Burr ML, Fehily AM, Gilbert JF. Effects of changes in fat, fish and fibre intakes on death and myocardial infarction: Diet and Reinfarction Trial (DART). Lancet 1989;2:757–61.
[29] Iso H, Kobayashi M, Ishihara J, Sasaki J, Okada K, Kita Y, et al, for the JPHC Study Group. Intake of Fish and n3 Fatty Acids and Risk of Coronary Heart Disease among Japanese: the Japan Public Health Center-Based (JPHC) Study Cohort I. Circulation 2006;113:195–202.
[30] Singh RB, Dubnov G, Niaz MA, Ghosh S, Singh R, Rastogi SS, et al. Effect of an Indo-Mediterranean diet on progression of coronary disease in high risk patients: a randomized single blind trial. Lancet 2002;360:1455–61.
[31] Gal D, Pella D, Singh RB. The effect of an alpha-linolenic acid rich diet on circadian rhythm of cardiac events. World Heart J 2008;1:49–56.
[32] Borg T. Cardiovascular diseases should be higher on the political agenda. Available at: http://www.euractiv.com/health/borg-cardiovascular-diseases-hig-interview-531516. Q3
[33] Halberg F, Cornélissen G, Otsuka K, Siegelova J, Fišer B, Dušek J, et al, the BIOCOS project. Extended consensus on need and means to detect vascular variability disorders (VVDs) and vascular variability syndromes (vvss). Int J Geronto-Geriatrics 2008;11:119–46.
[34] Writing committee:, Smith SCJr, Collins A, Chen D, Harold JG, Jessup M, Josephson S, et al. Moving from political declaration to action on reducing the global burden of cardiovascular diseases: a statement from the Global Cardiovascular Disease Taskforce [epub ahead of print]. Eur Heart J doi: http://dx.doi.org/10.1093/eurheartj/eht397.
[35] Writing committee:Smith SC Jr, Chen D, Collins A, Harold JG, Jessup M, Josephson S, et al. Moving from political declaration to action on reducing the global burden of cardiovascular diseases: a statement from the Global Cardiovascular Disease Taskforce. J Am Coll Cardiol 2013;62:2151–3.
[36] Smith SC Jr, Chen D, Collins A, Harold JG, Jessup M, Josephson S, et al. Moving from political declaration to action on reducing the global burden of cardiovascular diseases: a statement from the Global Cardiovascular Disease Taskforce. Circulation 2013;128:2546–8.
[37] Sarrafzadegan N, Kelishadi R, Sadri G, Malekafzali H, Pourmoghaddas M, Heidari K, et al. Outcomes of a comprehensive healthy lifestyle program on cardiometabolic risk factors in a developing country: The Isfahan Healthy Heart Program. Arch Iran Med 2013;16:4–11.
[38] World Heart Federation. 25 by 25. Available at: http://www.world-heartfederation.org/what-we-do/advocacy/25-by-25/, accessedNovember 11, 2013.
[39] Tucker KL, Buranapin S. Nutrition and aging in developing countries. J Nutr 2001;131:2417S–23S.

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