Public Health Nutrition: 21(12), 2267–2270 doi:10.1017/S1368980018000423

Commentary

The global nutrition transition: trends, disease burdens and policy interventions

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Submitted 3 December 2017: Final revision received 15 January 2018: Accepted 25 January 2018: First published online 6 March 2018

Abstract

Non-communicable diseases (NCD) have increased dramatically in developed and developing countries. Unhealthy diet is one of the major factors contributing to NCD development. Recent evidence has identified deterioration in aspects of dietary quality across many world regions, including low- and middle-income countries (LMIC). Most burdens of disease attributable to poor diet can be prevented or delayed as they occur prematurely. Therefore, it is important to identify and target unhealthy dietary behaviours in order to have the greatest impact. National dietary-related programmes have traditionally focused on micronutrient deficiency and food security and failed to acknowledge unhealthy dietary intakes as a risk factor that contributes to the development of NCD. Inadequate intakes of healthy foods and nutrients and excess intakes of unhealthy ones are commonly observed across the world, and efforts to reduce the double burden of micronutrient deficiency and unhealthy diets should be a particular focus for LMIC. Interventions and policies targeting whole populations are likely to be the most effective and sustainable, and should be prioritized. Population-based approaches such as health information and communication campaigns, fiscal measures such as taxes on sugar-sweetened beverages, direct restrictions and mandates, reformulation and improving the nutrient profile of food products, and standards regulating marketing to children can have significant and large impacts to improve diets and reduce the incidence of NCD. There is a need for more countries to implement population-based effective approaches to improve current diets.

Keywords
Nutrition transition
Diet
Disease burdens
Policy

Non-communicable diseases (NCD) including CVD have increased dramatically in developed and developing countries[1]. CVD account for most NCD deaths, of which over 80 % are estimated to occur in low- and middle-income countries (LMIC)[1,2]. Unhealthy diet is one of the major factors contributing to the development of NCD including CVD[1,2]. Over the past several decades, there has been dramatic worsening in dietary behaviours in many countries globally[3], contributing to the rise of NCD[4].

Current global dietary quality

The Global Dietary Database Consortium has investigated the consumption of major foods and nutrients in 187 countries from 1990 and 2010 with the aim to characterize global changes or trends in diet nationally and regionally[5]. In addition to individual foods and nutrients, two types of dietary patterns were assessed: (i) greater consumption of ten healthy foods; and (ii) lesser consumption of seven unhealthy foods. Globally, consumption of healthy items improved, while consumption of unhealthy items worsened across the world. Diets and their trends were very heterogeneous across the world regions. It was found that both types of dietary patterns improved in high-income countries but worsened in several low-income countries such in Africa and Asia. Interestingly, middle-income countries showed the largest improvement in dietary patterns based on healthy foods, but the largest deterioration in dietary patterns based on unhealthy items[5]. It is important to note that the disparities in dietary

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consumption by socio-economic status are well documented within some countries[6,7].

Numerous experimental and epidemiological studies have documented the health benefits or harms of specific foods or nutrients such as fats and oils, Na, sugar-sweetened beverages (SSB), fish, nuts, and fruits and vegetables[8–14], and recent studies have highlighted important trends in the consumption of specific foods and nutrients. The investigation of global consumption of key dietary fats demonstrated relatively stable global and regional consumption of saturated fat and cholesterol since 1990[8]. The mean consumption of saturated fat (9·4 % of energy intake; guidelines: <10 % of energy intake[9,10]) and dietary cholesterol (228 mg/d; guidelines: <300 mg/d[9,10]) were in line with current dietary recommendations[8]. Lowest intakes were identified in South and East Asia, South America and certain Caribbean nations. Worldwide, the consumption of polyunsaturated fats was far below optimal; in particular, it was low in several Pacific island nations with very high intakes of palm oil, creating adverse ratios of polyunsaturated to saturated fats, and in many South-East Asian and sub-Saharan African countries[8]. One hundred and forty-two countries out of 187 did not meet the recommendation for *n*-3 fatty acid consumption (>250 mg/d[9,10]). As expected, the highest *n*-3 consumption from seafood was identified in Pacific island nations, the Mediterranean basin, Iceland, South Korea and Japan. The findings also suggested substantial heterogeneity across the world in *trans*-fat consumption. Highest consumption of *trans*-fat was identified in North America, North Africa/Middle East, and South Asia and Pakistan[8].

In 2010, only six countries out of 187 met current dietary recommendations of <2 g/d set by WHO for consumption of Na (salt)[11]. The mean consumption of Na was 3·95 g/d, with the highest consumption identified in East Asia, Central Asia and Eastern Europe (mean >4·2 g/d) and in Central Europe and Middle East/North Africa (3·9–4·2 g/d)[11]. Globally, modest increase of Na intake has been observed between 1990 and 2010[11].

In the last decade, the interest in SSB has increased due to their identified negative effects on health, in particular related to dental caries, overweight and obesity[12]. In 2010, global mean consumption of SSB was 0·58 servings/d; fruit juice, 0·16 servings/d; and milk, 0·57 servings/d (8 oz (1 cup or 250 ml) per serving)[13]. The study identified significant heterogeneity in consumption of each type of beverage by region and age, with the highest consumption of SSB in the Caribbean; fruit juice in Australia and New Zealand; and milk in Central Latin America and parts of Europe[13]. The lowest consumption of all three beverages was observed in East Asia and Oceania. Interestingly, the highest consumption of SSB was in younger adults whereas the highest consumption of milk was in older adults[13].

The study on the global trends of major food groups found that the mean consumption of fruits was 81·3 g/d (guidelines: ≥300 g/d[9]) whereas mean vegetable consumption was 208·8 g/d (guidelines: ≥400 g/d[9]), with variations ranging from 34·6 to 493·1 g/d[14]. The highest consumption of vegetables was observed in Zimbabwe, several other southern sub-Saharan African nations and Greece; and lowest consumption was identified in Vanuatu, the Philippines, Hungary, Switzerland, Armenia and Georgia. High vegetable consumption was mainly due to high consumption of legumes in southern sub-Saharan Africa and tropical Latin America[14]. Even greater variation between countries was observed in whole grains consumption, from 1·3 to 334·3 g/d. The highest intake of whole grains was identified in some sub-Saharan African and South Asian nations[14].

National dietary-related programmes have traditionally focused on micronutrient deficiency and food security and failed to acknowledge unhealthy dietary intakes as a risk factor that contributes to the development of NCD, including CVD, cancers and diabetes which are the leading causes of mortality and disability worldwide[15]. As the research referenced above clearly indicates, inadequate intakes of healthy foods and nutrients and excess intakes of unhealthy ones are commonly observed across the world. Efforts to reduce the double burden of micronutrient deficiency and unhealthy diets should be a particular focus for LMIC.

Burden of disease attributable to poor diet

Worldwide, it has been estimated that nearly 75 % of all deaths and 60 % of all disability-adjusted life years by 2020 will be attributable to NCD such as CVD, cancers and type 2 diabetes, with the largest increases in burdens in LMIC[2,8]. Most of these burdens can be prevented or delayed as they occur prematurely. Therefore, it is important to identify and target widely prevalent modifiable risk factors in order to have the greatest impact. Unhealthy diet is one of the major risk factors of the increased trends in metabolic risk factors such as blood pressure, lipids, glucose and BMI, and a cause of mortality and disability worldwide[15,16].

High consumption of Na has been identified as a major risk factor for CVD due to elevated blood pressure[17]. A meta-analysis on Na intake and its impact on blood pressure found that reduced Na intake by 2·30 g/d was associated with a reduction of 3·82 mmHg in blood pressure[18]. Worldwide, 1·65 million annual deaths from cardiovascular causes were attributed to Na intake above the recommended daily limit (<2 g/d), with 61·9 % of deaths in men and 38·1 % in women[18]. These deaths accounted for nearly 10 % of deaths from cardiovascular causes. Eighty-four per cent of deaths occurred in LMIC and 40·4 % of these deaths were premature.

It has been established that consumption of SSB increases adiposity and weight gain[19,20], which is one of the major risk factors for CVD, type 2 diabetes and cancer. A study that analysed the consumption of SSB on burdens

of adiposity-related CVD found that 184 000 deaths/year globally are attributable to the consumption of SSB[16]. Of these SSB-related deaths, 75·9 % occurred in LMIC (5 % in low-income and 70·9 % in middle-income countries). In addition, a total of 8·5 million disability-adjusted life years were related to SSB consumption.

Types of dietary fats have been identified as another risk factor contributing to CVD development, in particular high consumption of *trans*- and saturated fats, and inadequate intake of polyunsaturated fats[21]. Worldwide, it has been estimated that 711 800 deaths annually are attributable to non-optimal consumption of polyunsaturated fats, corresponding to 10·3 % of global CHD mortality; and 250 900 and 537 200 deaths from CHD are attributable to high consumption of saturated and *trans*-fats, respectively[21]. In addition, the analysis of global trends revealed that *trans*-fat attributable burdens increased between 1990 and 2010 in LMIC. It has been found that consumption of fish or fish oil (which is a source of long-chain *n*-3 PUFA) and consumption of nuts have positive health outcomes and can be used as a strategy to prevent CVD[22,23]. The consumption of fish and nuts has significant multiple CVD-related physiological effects, such as lowering plasma TAG, reducing heart rate and blood pressure, improving cardiac filling and myocardial effeciency, and improving glycaemic control[22,23].

Suboptimal diet has been identified as the leading risk factor for cardiometabolic disease (CMD) mortality in the Middle East, North Africa and South Asia[24,25]. For example, suboptimal diet accounted for 48 % of CMD deaths in Morocco and 72 % of CMD deaths in the United Arab Emirates[24]. Non-optimal systolic blood pressure and BMI were identified as other leading risk factors of CMD mortality in most Middle East countries[24]. In addition, low intake of fruits accounted for 8–21 % of CMD deaths and low intake of whole grains was responsible for 7–22 % of CMD deaths in Middle Eastern countries[24].

Global data confirm that dietary factors pose a tremendous disease burden across the world. Limited evidence suggests worsening trends in dietary patterns have also occurred in LMIC. Given the difference in prevalence and specific intake levels of different dietary risk factors, such analyses help to identify and prioritize key targets for individual countries.

Key interventions to address the nutrition transition

Diets in LMIC are changing due to changes in food production systems, providing cheap foods of minimal nutritional quality ('empty calories'); increased access to and consumption of poor-quality foods due to changes in food distribution and increased marketing by multinational food companies; and also regulatory environments such as the World Trade Organization and freer flow of goods, services and technologies[3]. For example, reduced edible-oil prices and increased consumption of these oils in China can be linked to specific agreements with no limits on imports[3]. As a result, many LMIC have adopted Western diets which are broadly defined by high consumption of refined carbohydrates, added sugars and animal-source foods[26].

Food programmes and policies should encourage dietary patterns towards increased whole grains, legumes, vegetables and fruits; and reduced refined carbohydrates, SSB, excess Na and processed meats[14]. Na reduction programmes should be strengthened and supported by enhanced surveillance[11,18]. There is robust and growing evidence that population-based approaches such as health information and communication campaigns, fiscal measures such as taxes on SSB, direct restrictions and mandates (e.g. limiting the sale of SSB in schools and workplaces), reformulation and improving the nutrient profile of food products[27,28], and standards regulating marketing to children can have significant and large impacts to improve diets and reduce the incidence of NCD[3,29–33].

LMIC are facing the dual burden of nutrient deficiency and unhealthy dietary patterns which is a major challenge for food programmes and policies to address food insecurity without adding to the burden of CVD, overweight and obesity[3]. A systematic policy review of strategies proposed to prevent NCD in LMIC found that only 47 % (54/116) of LMIC had NCD-related strategies and only 31 % of these countries (36/116) had proposed actions to promote healthier diets[32]. Only 12 % proposed a policy that addressed multiple key risk factors (Na, fat, fruit and vegetable consumption, physical activity) and 25 % addressed only one of the risk factors reviewed[34]. Such findings suggest policy responses to address NCD including CVD in LMIC are inadequate. LMIC urgently need to adopt and scale up effective population-based interventions to improve dietary risk factors for CVD.

Conclusion

In the last decades, there has been a dramatic change in the way people eat and drink, which has contributed to the increase of NCD, including CVD in particular, in LMIC. A comprehensive approach is needed requiring all sectors – including health, finance, transport, education, agriculture, planning and others – to collaborate to reduce diet-related CVD in LMIC. Interventions and policies targeting whole populations are likely to be the most effective and sustainable, and should be prioritized.

Acknowledgements

Financial support: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors. The study did not receive any specific non-financial support. *Conflict of interest:* None. *Authorship:* All authors (R.R., J.H.Y.W. and G.M.S.) contributed to the design of the manuscript. R.R. performed the original search

and drafted the manuscript. All authors (R.R., J.H.Y.W. and G.M.S.) reviewed and contributed to revision of the manuscript. *Ethics of human subject participation:* Ethical approval was not required because the paper used the findings of existing studies which were available in the public domain.

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